Specifications for

Robinson Palestine Water Commission

Water Treatment Plant and Campus

Funding Source:
IEPA PWS RLF
L17-6744

Robinson, IL

Project No. 0210007.00

November 2025

BOOK 1: Project and Bidding Documents
Book 2: Technical Specifications

BOOK 1 OF 2

Robinson Palestine Water Commission
Water Treatment Plant and Campus

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ADVERTISEMENT FOR BIDS

ROBINSON PALESTINE WATER COMMISSION
WATER TREATMENT PLANT AND CAMPUS

Bids for the construction of the Project will be received by the Robinson Palestine Water Commission's office located at **108 E. Poplar Street, Robinson, IL 62454,** until **February 4th, 2026, at 10:00 a.m.** local time. At that time, the Bids received will be publicly opened and read.

The Project includes the following Work:

Division A: Water Treatment Plant Campus

Division A includes a new 1,800 gallon per minute filtration and Per- and Polyfluoroalkyl (PFAS) removal water treatment plant with related site improvements and accessories; associated pumps, piping, valves, structures, electrical work and appurtenances. Electrical work includes outside conduits, feeders, and light poles. The work shall include all labor, supervision, materials, supplies, transportation, equipment, and services necessary and required to perform the project as set forth in the Contract Documents. Buildings include the office building with maintenance shop area, cold storage, and water treatment plant. Division A includes all work not defined in Division B and C.

Division B: Ground Storage Tanks

Division B includes two (2) one million gallons (1,000,000 gallons) ground storage tanks. Work includes site grading, earthwork, foundation, steel erection, and coating. Foundation/concrete work to include valve vault, valve(s), and piping extend outside of the vault or foundation shall be included. Electrical conduits, conductors, and pressure sensors are not included in the contract.

Division C: Underground Piping

Division C includes all underground water main, water services, sanitary sewer, and storm sewer within 5' of the building/structure or foundation. In addition to the water main, all manhole structures (excluding the head tank) shall be included. Fire hydrants to flush the head tank shall be included in Division C work. This work includes the conversion of the raw water main to finish water main. This will require multiple mobilization to connect, disconnect, tap and plug the water mains.

Provided the Contractor furnishes proof of proper insurance and bonding in a timely manner, it is anticipated that a Notice of Award of contract will be issued within 60 days of the date bids are opened and that a Notice to Proceed will be issued within 10 days of the date of the Notice of Award. This Project shall reach **Substantial Completion 450 days** and **Final Completion 510 days** after the date when the Contract Times commence. Completion dates and requirements are further outline in the Agreement, document C-520.

Obtaining the Bidding Documents

The Issuing Office for the Bidding Documents is Farnsworth Group, Inc. 400 W Jefferson, Suite A, Effingham, IL 62401. Information and Bidding Documents for the Project can be found at the following designated website: **http://bidlist.f-w.com/**

Bidding Documents may be downloaded from the designated website. Prospective Bidders are required to register with the designated website as a plan holder, even if Bidding Documents are obtained from a plan room or source other than the designated website in either electronic or paper format. The designated website will be updated periodically with addenda, lists of registered plan holders, reports, and other information relevant to submitting a Bid for the Project. All official notifications, addenda, and other Bidding Documents will be offered only through the designated website. Neither Owner nor

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Engineer will be responsible for Bidding Documents, including addenda, if any, obtained from sources other than the designated website.

Prospective Bidders may examine the Bidding Documents at the Issuing Office on Monday through Friday between the hours of 8:00 AM and 5:00 PM. Partial sets of Bidding Documents will not be available from the Issuing Office. Neither Owner nor Engineer will be responsible for full or partial sets of Bidding Documents, including addenda, if any, obtained from sources other than the Issuing Office.

Any contract or contracts awarded under this invitation for bids are expected to be funded in part by a loan from the Illinois Environmental Protection Agency (Illinois EPA). Neither the State of Illinois nor any of its departments, agencies, or employees is or will be a party to this invitation for bids or any resulting contract. **The procurement will be subject to regulations contained in the Procedures for Issuing Loans from the** Public Water Supply Loan Program (PWSLP)**,** the Davis-Bacon Act (40 USC 276a through 276a-5) as defined by the United States Department of Labor, the Employment of Illinois Workers on Public Works Act (30 ILCS 570), Illinois Works Jobs Program Act Apprenticeship Initiative (30 ILCS 559/20-1), DBE Policy per 40 CFR Part 33, as amended, and the federal "Build America, Buy America Act" requirements as contained in the federal Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, the "Use of American Iron and Steel" requirements as contained in Section 436 of H.R. 3547, and the Consolidated Appropriations Act, 2014. Bidders are required to comply with the Illinois Environmental Protection Agency DBE program. The requirements for bidders and contractors under this order are explained in 41 CFR 60-4

This procurement is also subject to the loan recipient's policy regarding the increased use of disadvantaged business enterprises (DBE). The loan recipient's policy requires all bidders to undertake specified affirmative efforts advertise for DBE's at least sixteen (16) days prior to bid opening. The policy is contained in the specifications. **Advertisements for disadvantaged business enterprises must be advertised in DAILY regional newspapers, or approved equivalent.**

Bid Security

A certified check or bank draft payable to the order of Robinson Palestine Water Commission, or a satisfactory Bid Bond executed by the Bidder and an acceptable surety in an amount equal to five percent (5%) of the total Base Bid for the Divisions bid shall be submitted with each Bid.

Instructions to Bidders.

For all further requirements regarding bid submittal, qualifications, procedures, and contract award, refer to the Instructions to Bidders that are included in the Bidding Documents.

Bid Hold Time

Bids will be held good for a period of **ninety (90) days** subsequent to the opening of Bids.

Pre-Bid Conference

The pre-bid conference will be held on December 17th, 2025, at 10:00 a.m. at Robinson Palestine Water Commission's office at 108 E. Poplar Street, Robinson, IL 62454.

This Advertisement is issued by:

Owner: **Robinson Palestine Water Commission**
By: Jason Wesner
Title: Manager
Date: November 14, 2025

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INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACT

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ARTICLE 1—DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. *Issuing Office*—The office from which the Bidding Documents are to be issued, and which registers plan holders.

ARTICLE 2—BIDDING DOCUMENTS

2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder's responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.

2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.

2.03 Owner has established a Bidding Documents Website as indicated in the Advertisement or invitation to bid. Owner recommends that Bidder register as a plan holder with the Issuing Office at such website, and obtain a complete set of the Bidding Documents from such website. Bidders may rely that sets of Bidding Documents obtained from the Bidding Documents Website are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.

2.04 Bidder may register as a plan holder and obtain complete sets of Bidding Documents, in the number and format stated in the Advertisement or invitation to bid, from the Issuing Office. Bidders may rely that sets of Bidding Documents obtained from the Issuing Office are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.

2.05 Plan rooms (including construction information subscription services, and electronic and virtual plan rooms) may distribute the Bidding Documents, or make them available for examination. Those prospective bidders that obtain an electronic (digital) copy of the Bidding Documents from a plan room are encouraged to register as plan holders from the Bidding Documents Website or Issuing Office. Owner is not responsible for omissions in Bidding Documents or other documents obtained from plan rooms, or for a Bidder's failure to obtain Addenda from a plan room.

2.06 *Electronic Documents*

A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.

1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader Version 20.009.20063 or later. It is the intent

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of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.06.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

ARTICLE 3—QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, after submitting its Bid and within 10 days of Owner's request, Bidder must submit the following information:

A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.

B. A written statement that Bidder is authorized to do business in the state where the Project is located, or a written certification that Bidder will obtain such authority prior to the Effective Date of the Contract.

C. Bidder's state or other contractor license number, if applicable.

D. Subcontractor and Supplier qualification information.

E. Other required information regarding qualifications.

3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.

3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

ARTICLE 4—PRE-BID CONFERENCE

4.01 A non-mandatory pre-bid conference will be held at the time and location indicated in the Advertisement or invitation to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference; however, attendance at this conference is not required to submit a Bid.

4.02 Information presented at the pre-Bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions

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at the pre-Bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

ARTICLE 5—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

5.01 *Site and Other Areas*

A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

5.02 *Existing Site Conditions*

A. *Subsurface and Physical Conditions; ~~Hazardous Environmental Conditions~~*

1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:

a. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.

~~b. Those drawings known to Owner of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data.~~

~~c. Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.~~

d. Technical Data contained in such reports and drawings.

2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05 of the General Conditions, and not in the drawings referred to in Paragraph 5.02.A of these Instructions to Bidders. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

5.03 *Other Site-related Documents*

A. No other Site-related documents are available.

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5.04 *Site Visit and Testing by Bidders*

A. Bidder is required to visit the Site and conduct a thorough visual examination of the Site and adjacent areas. During the visit the Bidder must not disturb any ongoing operations at the Site.

~~B. A Site visit is scheduled following the pre-bid conference. Maps to the Site will be available at the pre-Bid conference.~~

C. Bidders visiting the Site are required to arrange their own transportation to the Site.

D. All access to the Site other than during a regularly scheduled Site visit must be coordinated through the Owner. Bidder must conduct the required Site visit during normal working hours.

E. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.

F. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder general access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site. Bidder is responsible for establishing access needed to reach specific selected test sites.

G. Bidder must comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.

H. Bidder must fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

5.05 *Owner's Safety Program*

A. Site visits and work at the Site may be governed by an Owner safety program. If an Owner safety program exists, it will be noted in the Supplementary Conditions.

5.06 *Other Work at the Site*

A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Express Representations and Certifications in Bid Form, Agreement*

A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder's examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should

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review these representations and certifications, and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.

B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

ARTICLE 7—INTERPRETATIONS AND ADDENDA

7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.

7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information and submittal procedures for such questions are as follows:

A. Farnsworth Group, Inc.
Andrew Hanfland, PE
Sr. Engineer Manager
Email: ahanfland@f-w.com (preferred)
Phone: 217-343-6993

B. Farnsworth Group, Inc.
Sanju Mokammel EIT
Eng. Intern
Email: ssanju@f-w.com

7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received less than seven days prior to the date for opening of Bids may not be answered.

7.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

ARTICLE 8—BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of five (5) percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a Bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. Such Bid bond will be issued in the form included in the Bidding Documents.

8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract and furnish the required Contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited, in whole in the case of a penal sum bid bond, and to the extent of Owner's damages in the case of a damages-form bond. Such forfeiture will be Owner's exclusive remedy if Bidder defaults.

8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the

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Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within 7 days after the Bid opening.

ARTICLE 9—CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be (a) substantially completed and (b) ready for final payment, and (c) Milestones (if any) are to be achieved, are set forth in the Agreement.

9.02 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 10—SUBSTITUTE AND "OR EQUAL" ITEMS

10.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those "or-equal" or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an "or-equal" or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the deadline for receipt of bids. Each such request must comply with the requirements of Paragraphs 7.05 and 7.06 of the General Conditions, and the review of the request will be governed by the principles in those paragraphs. The burden of proof of the merit of the proposed item is upon Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all registered Bidders. Bidders cannot rely upon approvals made in any other manner.

10.02 All prices that Bidder sets forth in its Bid will be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

ARTICLE 11—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

11.01 A Bidder must be prepared to retain specific Subcontractors and Suppliers for the performance of the Work if required to do so by the Bidding Documents or in the Specifications. If a prospective Bidder objects to retaining any such Subcontractor or Supplier and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

11.02 The apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors or Suppliers proposed within five days after Bid opening.

11.03 If requested by Owner, such list must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor or Supplier, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent

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Successful Bidder will submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

11.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor or Supplier, so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.07 of the General Conditions.

ARTICLE 12—PREPARATION OF BID

12.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.

B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."

12.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.

12.03 A Bid by a corporation must be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation must be shown.

12.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.

12.05 A Bid by a limited liability company must be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown.

12.06 A Bid by an individual must show the Bidder's name and official address.

12.07 A Bid by a joint venture must be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.

12.08 All names must be printed in ink below the signatures.

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12.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.

12.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be shown.

12.11 The Bid must contain evidence of Bidder's authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.

12.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder's licensure, or Bidder must certify in writing that it will obtain such licensure within the time for acceptance of Bids and attach such certification to the Bid. Bidder's state contractor license number, if any, must also be shown on the Bid Form.

ARTICLE 13—BASIS OF BID

13.01 *Lump Sum*

A. Bidders must submit a Bid on a lump sum basis as set forth in the Bid Form.

13.02 ~~*Base Bid with Alternates*~~

~~A. Bidders must submit a Bid on a lump sum basis for the base Bid and include a separate price for each alternate described in the Bidding Documents and as provided for in the Bid Form. The price for each alternate will be the amount added to or deleted from the base Bid if Owner selects the alternate.~~

~~B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form.~~

13.03 ~~*Sectional Bids*~~

~~A. Bidders may submit a Bid on any individual section or any combination of sections, as set forth in the Bid Form.~~

~~B. Submission of a Bid on any section signifies Bidder's willingness to enter into a Contract for that section alone at the price offered.~~

~~C. If Bidder submits Bids on individual sections and a Bid based on a combination of those sections, such combined Bid need not be the sum of the Bids on the individual sections.~~

~~D. Bidders offering a Bid on one or more sections must be capable of completing the Work covered by those sections within the time period stated in the Agreement.~~

13.04 ~~*Cost-Plus-Fee Bids*~~

~~A. Bidders must submit a Bid on the Contractor's fee, which must be in addition to compensation for Cost of the Work. Such fee must be either (1) a fixed fee, (2) percentages of specified categories of costs, or (3) a percentage applicable to the Cost of the Work as a whole, as set forth in the Bid Form.~~

~~B. If the Contractor's fee, as set forth in the Bid Form, is to be based on percentages of categories of cost, or on a percentage applicable to the Cost of the Work as a whole, then~~

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~~Bidders must enter a maximum amount limiting the total fee if required by the Bid Form to do so.~~

~~C. Bidders must submit a Bid on the Guaranteed Maximum Price, setting a maximum amount on the compensable Cost of the Work plus Contractor's fee, if required by the Bid Form to do so.~~

13.05 *Unit Price*

A. Bidders must submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.

B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity", which Owner or its representative has set forth in the Bid Form, for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

13.06 *Allowances*

A. For cash allowances the Bid price must include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 13.02.B of the General Conditions.

13.07 ~~*Price-Plus-Time Bids*~~

~~A. The Owner will consider the time of Substantial Completion commitment made by the Bidder in the comparison of Bids.~~

~~B. Bidder must designate the number of days required to achieve Substantial Completion of the Work and enter that number in the Bid Form as the total number of calendar days to substantially complete the Work.~~

~~C. The total number of calendar days for Substantial Completion designated by Bidder must be less than or equal to a maximum of **[number]**, but not less than the minimum of **[number]**. If Bidder purports to designate a time for Substantial Completion that is less than the allowed minimum, or greater than the allowed maximum, Owner will reject the Bid as nonresponsive.~~

~~D. The Agreement as executed will contain the Substantial Completion time designated in Successful Bidder's Bid, and the Contractor will be assessed liquidated damages at the rate stated in the Agreement for failure to attain Substantial Completion within that time.~~

~~E. Bidder must also designate the time in which it will achieve Milestones, and achieve readiness for final payment. Such time commitments must be consistent with the "Time of Substantial Completion" to which Bidder commits. The Agreement as executed will contain, as binding Contract Times, Successful Bidder's time commitments regarding Milestones, as applicable, and readiness for final payment.~~

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ARTICLE 14—SUBMITTAL OF BID

14.01 The Bidding Documents include one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 2 of the Bid Form.

14.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must be enclosed in a plainly marked package with the Project title, and, if applicable, the designated portion of the Project for which the Bid is submitted, the name and address of Bidder, and must be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement.

14.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 15—MODIFICATION AND WITHDRAWAL OF BID

15.01 An unopened Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

15.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 and submit a new Bid prior to the date and time for the opening of Bids.

15.03 ~~If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, the Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, the Bidder will be disqualified from further bidding on the Work.~~

ARTICLE 16—OPENING OF BIDS

16.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

17.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this

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period. **Bid acceptance is subject to Illinois Environmental Protection Agency review that takes up to 90 days, bid will remain subject to acceptance for 90 days.**

ARTICLE 18—EVALUATION OF BIDS AND AWARD OF CONTRACT

18.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.

18.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.

18.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner will reject the Bid as nonresponsive.

18.04 If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.

18.05 *Evaluation of Bids*

A. In evaluating Bids, Owner will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

~~B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form. To determine the Bid prices for purposes of comparison, Owner will announce to all bidders a "Base Bid plus alternates" budget after receiving all Bids, but prior to opening them. For comparison purposes alternates will be accepted, following the order of priority established in the Bid Form, until doing so would cause the budget to be exceeded. After determination of the Successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to said Successful Bidder on its base Bid and any combination of its additive alternate Bids for which Owner determines funds will be available at the time of award.~~

~~C. For determination of the apparent low Bidder(s) when sectional bids are submitted, Bids will be compared on the basis of the aggregate of the Bids for separate sections and the Bids for combined sections that result in the lowest total amount for all of the Work.~~

D. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.

~~E. For the determination of the apparent low Bidder when cost-plus-fee bids are submitted, Bids will be compared on the basis of the Guaranteed Maximum Price set forth by Bidder on the Bid Form.~~

~~F. Bid prices will be compared after adjusting for differences in time of Substantial Completion (total number of calendar days to substantially complete the Work) designated by Bidders. The adjusting amount will be determined at the rate set forth in the Agreement for liquidated damages for failing to achieve Substantial Completion, or such other amount that Owner has designated in the Bid Form.~~

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~~1. The method for calculating the lowest bid for comparison will be the summation of the Bid price shown in the Bid Form plus the product of the Bidder-specified time of Substantial Completion in calendar days times the rate for liquidated damages **[or other Owner-designated daily rate]** in dollars per day.~~

~~2. This procedure is only used to determine the lowest bid for comparison and contractor selection purposes. The Contract Price for compensation and payment purposes remains the Bid price shown in the Bid Form.~~

18.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

18.07 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 19—BONDS AND INSURANCE

19.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds, other required bonds (if any), and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by required bonds and insurance documentation.

19.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 20—SIGNING OF AGREEMENT

20.01 When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Agreement and any bonds and insurance documentation required to be delivered by the Contract Documents to Owner. Within 10 days thereafter, Owner will deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 21—SALES AND USE TAXES

21.01 Owner is exempt from Illinois state sales and use taxes on materials and equipment to be incorporated in the Work. ~~(Exemption No. **[number]**)~~. Said taxes must not be included in the Bid. Refer to Paragraph SC-7.10 of the Supplementary Conditions for additional information.

~~**ARTICLE 22—CONTRACTS TO BE ASSIGNED**~~

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BID FORM FOR CONSTRUCTION CONTRACT

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

Project No. 0210007.00
Water Treatment Plant and Campus

Division A: Water Treatment Plant and Campus
Division B: Ground Storage Tanks
Division C: Underground Piping

ARTICLE 1—OWNER AND BIDDER

1.01 This Bid is submitted to: **Robinson-Palestine Water Commission**
ATTN: Jason Wesner
108 E. Poplar
Robinson, IL 62454

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2— BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 30 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

1. Contractor must review the following table and initial next to each item to show the Contractor understands the specific requirements and what is expected. **Failure to initial next to each item may result in rejection of bid.**

#	ITEM	INTITALS
1.	Installation of the utilities shall be the Contractors responsibility to locate or have located all utilities being crossed, connected to, or otherwise impacted. It shall be required to locate these utilities regardless of the installation method utilized for the proposed utilities. Utilities crossed by Horizontal Directional Drilling shall also be located and exposed by the Contractor. It shall be the Contractor's responsibility to repair any damaged utility and for any damage to property, private or public associated with damaged utilities, during the installation of the water main.	
2.	All bidders to undertake specified efforts at least sixteen (16) days prior to bid opening for advertisement regarding DBE's. Certificate of publication of said advertisement must be included in bidding documents. Advertisement MUST be in DAILY regional newspaper, Dodge Report, or approved equivalent.	
3.	Bidding Contractor shall provide written acknowledgement that they will self-perform a minimum of thirty percent (30%) of all labor (manhours) on this project.	

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ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

3.01 ~~*Unit Price Bids*~~

3.02 *Lump Sum Bids*

A. Bidder will complete the Work in accordance with the Contract Documents for the following lump sum (stipulated) price(s)

BASE BID

Division A: Water Treatment Plant and Campus

Division A includes a new 1,800 gallon per minute filtration and Per- and Polyfluoroalkyl (PFAS)removal water treatment plant with related site improvements and accessories; sitework, concrete and gravel paving, seeding, associated pumps, piping, valves, meters, structures, head tank, chemical storage, feed equipment, electrical work, plumbing, HVAC, instrumentation and controls, radio telemetry, and related accessories and appurtenances as specified and shown on the plan drawings. Electrical work includes outside conduits, feeders, and light poles. The work shall include all labor, supervision, materials, supplies, transportation, equipment, and services necessary and required to perform the project as set forth in the Contract Documents. Buildings include the office building with maintenance shop area, cold storage, and water treatment plant. Division A includes all work not defined in Division B and C.

Division A Supplemental Bid #1:

Gas Service Lump Sum Total: $100,000

Division A Supplemental Bid #2:

Electrical Service Lump Sum Total: $150,000

Division A Base Bid Total:_____

Division A Lump Sum Total: _____($_____)

Division B: Ground Storage Tanks

Division B includes two (2) one million gallons (1,000,000 gallons) ground storage tanks. Work includes site grading, earthwork, foundation, steel erection, and coating. Foundation/concrete work to include valve vault, valve(s), and piping extend outside of the vault or foundation shall be included. Electrical conduits, conductors, and pressure sensors are not included in the contract.

Division B Lump Sum Total: _____($_____)

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Division C: Underground Piping

Division C includes all underground water main, water services, sanitary sewer, and storm sewer within 5' of the building/structure or foundation. In addition to the water main, all manhole structures (excluding the head tank) shall be included. Fire hydrants to flush the head tank shall be included in Division C work. This work includes the conversion of the raw water main to finish water main. This will require multiple mobilization to connect, disconnect, tap and plug the water mains.

Division C Lump Sum Total: _____($_____)

ALTERNATE BID

PROCESS EQUIPMENT MANUFACTURER ALTERNATIVE

Voluntary Alternative Bid to substitute Westech from Salt Lake City, UT as the Process Equipment Manufacturer in lieu of Tonka Water equipment as provided in the Base Bid inclusive of forced draft aerator, vertical pressure filters, and ion exchange vessels (softeners and organics removal units). Per the specifications, the process equipment manufacturer shall provide the process equipment and all appurtenances described in the specifications including, but not limited to; face piping, valves, controls and related appurtenances. Alternative shall indicate if Process Equipment Manufacturer Alternative is an Increase (+) or Decrease (-) from the Base Bid. If bidder elects not to submit pricing for the voluntary process equipment manufacturer alternate, bidder shall indicate Not Applicable on bid lines below.

Process Equipment Manufacturer Alternative (WesTech):

_____($_____)

Total Base Bid (Division A, B, & C) Plus Equipment Manufacturer Alternative

_____($_____)

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The Bidder shall provide a list of Subcontractors, Suppliers, individuals or entities for the various subcontract portions of work and major equipment items as specified:

Subcontract or Equipment Specification Section	General Description	Subcontractor, Supplier, individual, or entities
Site Civil Subcontract	General site work, excavation, earthwork, seeding, etc.	
Building Subcontract	Building Construction	
	Roofing Construction	
Concrete Subcontract	Cast-in-place concrete construction including foundations, access roads and driveways, etc.	
Mechanical Subcontract	Piping inside and outside buildings and structures, underground and exposed piping, plumbing equipment, accessories, process piping, piping insulation, etc.	
HVAC Subcontract	Heating and ventilating system, air conditioning, temperature control system for WTP building	
Electrical Subcontract	Electric power distribution, lighting, control wiring and conduits	
Painting Subcontract	Building and Equipment to be painted on site	
Instrumentation & Controls Subcontract	Panel Fabricator (MCP and LCPs)	
	Radio System Supplier	
	Network Consultant	

ARTICLE 4—BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

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C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

"corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;

"fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

"collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

"coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the e execution of the Contract.

4.02 BIDDER certifies that wages paid in connection with the PROJECT shall be paid at prevailing rates not less than those prevailing under the Davis-Bacon Wage Act (40 USC 3141 through 3148) as defined by the Department of Labor. Bidder further certifies that the provisions contained in the following clauses will be exercised in the performance of any contract resulting from this BID and are made a part of the CONTRACT DOCUMENTS thereto by their inclusion in the BID as follows:

4. "Minimum wages.

i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in

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§ 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)1(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Sub recipients may obtain wage determinations from the U.S. Department of Labor's web site, www.sam.gov.

ii) (A) The sub recipient, on behalf of USEPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The USEPA award official shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

5. The work to be performed by the classification requested is not performed by a classification in the wage determination; and

3. The classification is utilized in the area by the construction industry; and

4. The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

B. If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the sub recipient agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the sub recipient to IEPA. IEPA will transmit the report, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify or disapprove every additional classification action within 30 days of receipt and will so advise IEPA or will notify IEPA within the 30- day period that additional time is necessary.

C. In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the sub recipient do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the questions, including the views of all interested parties and the recommendation of the award official, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

D. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in

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the classification under this contract from the first day on which work is performed in the classification.

iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

i) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program. Provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding, the sub recipient shall upon written request of the USEPA Award Official or an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records.

i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or

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program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

E. The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the sub recipient, that is, the entity that receives the sub-grant or loan from IEPA. Such documentation shall be available on request of IEPA or USEPA. As to each payroll copy received, the sub recipient shall provide written confirmation indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/whd/forms/index.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the sub recipient for transmission to IEPA or USEPA, if requested, for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sub recipient.

F. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

1. That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR Part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR Part 5, and that such information is correct and complete

2. That each laborer and mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR Part 3;

3. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

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G. The weekly submission of a properly executed certification set forth on the reverse side of optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

H. The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of IEPA, USEPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or IEPA may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees –

i) Apprentices. Apprentices will be permitted to work at less than predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less

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than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal

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employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the USEPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and sub recipients, IEPA, USEPA, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

    i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

    ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

    iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

11. Contract Provision for Contracts in Excess of $100,000

    b. Contract Work Hours and Safety Standards Act. The sub recipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of the section in full in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFF 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

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12. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

13. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefore shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clauses set forth in paragraph (b)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

14. Withholding for unpaid wages and liquidated damages. The sub recipient, upon written request of the USEPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, form any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract su7bject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

15. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

    b. In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Sub recipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Sub recipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the IEPA, USEPA and the Department of Labor, and the

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contractor or subcontractor will permit such representatives to interview employees during working hours on the job

16. Compliance Verification

    a. The sub recipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The sub recipient must use Standard Form 1445 or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from USEPA on request.

    b. The sub recipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, the sub recipient must conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor's submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract. Sub recipients must conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. Sub recipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

    c. The sub recipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors and subcontractors are paying the appropriate wage rates. The sub recipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, the sub recipient must spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Sub recipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the sub recipient shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

    d. The sub recipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S. Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

    e. Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the USEPA DB contact listed above and to the appropriated DOL Wage and Hour District Office listed at http://www.dol.gov/whd".

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4.03 By submission of the bid, each bidder certifies, and in the case of a joint bid each party thereto certifies as to his own organization, that in connection with the bid:

A. The prices in the bid have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;

B. Unless otherwise required by law, the prices which have been quoted in the bid have not knowingly been disclosed by the bidder, prior to opening, directly or indirectly to any other bidder or to any competitor; and

C. No attempt has been made or will be made by the bidder to induce any other person or firm to submit or withhold a bid for the purpose of restricting competition.

4.04 Each person signing the bid shall certify that:

A. He is the person in the bidder's organization responsible within that organization for the decision as to the prices being bid and that he has not participated, and will not participate, in any action contrary to 4.03.A through 4.03.C above; or

B. He is not the person in the bidder's organization responsible within that organization for the decision as to the prices being bid but that he has been authorized to act as agent for the persons responsible for such decision in certifying that such persons have not participated, and will not participate, in any action contrary to 4.03.A through 4.03.C above, and as their agent shall so certify; and shall also certify that he has not participated, and will not participate, in any action contrary to 4.03.A through 4.03.C above

ARTICLE 5— ATTACHMENTS TO THIS BID

5.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security in the form of a 5% Bid Bond;

B. List of Proposed Subcontractors, Suppliers, individuals or entities proposed for the work as required above and referenced in Article 7.06 of the Supplementary Conditions;

C. Required Signed and Executed Equipment Manufacturer Program Certification, page 000640-1

D. Required Bidder Qualification Statement with supporting data

E. Bidding Contractor shall provide written acknowledgement that they will self-perform a minimum of thirty percent (30%) of all labor (manhours) on this project;

F. List of Project References including specific contact names, valid and working contact phone number and e-mail address. References will be contacted for the low bidders as deemed appropriate by the Engineer;

G. Bidder Certification in Compliance with Article 33E to the "Criminal Code of 2012", page 0650-21;

H. Certification of Non-Segregated Facilities, page 0650-13;

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I. Notice to Labor Unions or Other Organization of Workers Nondiscrimination in Employment, submit one for each labor union that Contractor has contracts with, page 0650-14;

J. Certification Regarding Debarment, page 0650-15;

K. Requirements for Disadvantaged Business Enterprise Participation, pages 0675-1 to 0675-15;

L. Bidder Certification for Advertisement Regarding Subcontracting Opportunities for Disadvantaged Businesses, page 0675-16;

M. Bidder Certification Regarding the Use of American Iron and Steel Products, page 0680-1;

N. Evidence of authority to do business in the State of Illinois; Contractor shall submit a Certificate of Good Standing from the Illinois Secretary of State website. http://www.ilsos.gov/corporatellc/;

O. Required Bidder Qualification Statement with supporting data;

P. Written acknowledgment of Illinois Compiled Statutes, 1992, ACT 570 Employment of Illinois Workers on Public Works Act;

Q. Written acknowledgement of Illinois Public Act 93-0642, which amends the Illinois Procurement Code;

R. Certification of Employment of Illinois Workers on Public Works Act, page 0685-1;

S. Illinois Works Jobs Program Act Apprenticeship Initiative Contractor Certification, page 0685-7

T. The failure to include any listed attachments with a bid proposal is sufficient cause for bid rejection. The omission of any listed attachment will require, at the least, more intense evaluation of the bid. Bidders shall review all hard copy submissions to assure that all listed attachments are included.

ARTICLE 6—TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

7.01 *Bid Acceptance Period*

A. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

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7.02 *Instructions to Bidders*

A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

7.03 *Receipt of Addenda*

A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

ARTICLE 8—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

8.01 *Bidder's Representations*

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

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8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

8.02 *Bidder's Certifications*

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.

2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.

3. Bidder has not solicited or induced any individual or entity to refrain from bidding.

4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:

a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.

b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.

c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.

d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

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BIDDER hereby submits this Bid as set forth above:

Bidder:

_____

(typed or printed name of organization)

By: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

Address for giving notices:

_____

_____

Bidder's Contact:

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Phone: _____

Email: _____

Address:

_____

_____

_____

Bidder's Contractor License No.: (if applicable) _____

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BID BOND (PENAL SUM FORM)

Bidder Name: Address *(principal place of business)*:	**Surety** Name: Address *(principal place of business)*:
Owner Name: Address *(principal place of business)*:	**Bid** Project *(name and location)*: Bid Due Date:
Bond Penal Sum: Date of Bond:	

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

Bidder	Surety
_____ *(Full formal name of Bidder)*	_____ *(Full formal name of Surety) (corporate seal)*
By: _____ *(Signature)*	By: _____ *(Signature) (Attach Power of Attorney)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title: _____	Title: _____
Attest: _____ *(Signature)*	Attest: _____ *(Signature)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title:	Title:

Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.

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1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation will be null and void if:
    3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
    3.2. All Bids are rejected by Owner, or
    3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

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QUALIFICATIONS STATEMENT

Prepared By









Endorsed By





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ARTICLE 1—GENERAL INFORMATION

1.01 Provide contact information for the Business:

Legal Name of Business:			
Corporate Office			
Name:		Phone number:	
Title:		Email address:	
Business address of corporate office:			
Local Office			
Name:		Phone number:	
Title:		Email address:	
Business address of local office:			

ARTICLE 2—DIVERSE BUSINESS CERTIFICATIONS

2.01 Provide information regarding Business's Diverse Business Certification, if any. Provide evidence of current certification.

Certification	Certifying Agency	Certification Date
☐ Disadvantaged Business Enterprise		
☐ Minority Business Enterprise		
☐ Woman-Owned Business Enterprise		
☐ Small Business Enterprise		
☐ Disabled Business Enterprise		
☐ Veteran-Owned Business Enterprise		
☐ Service-Disabled Veteran-Owned Business		
☐ HUBZone Business (Historically Underutilized) Business		
☐ Other		
☐ None		

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ARTICLE 3—SAFETY

3.01 Provide information regarding Business's safety organization and safety performance.

Name of Business's Safety Officer:		
Safety Certifications		
Certification Name	Issuing Agency	Expiration

ARTICLE 4—CONSTRUCTION EXPERIENCE

4.01 Provide information that will identify the overall size and capacity of the Business.

Average number of current full-time employees:	

4.02 List a minimum of three and a maximum of six projects completed in the last 5 years and provide indicated information to demonstrate the Business's experience with similar construction projects. Provide project references including specific contact names, valid phone numbers, and emails. References will be contracted for the low bidders as deemed appropriate by the Engineer.

4.03

Years of experience with projects like the proposed project:			
As a general contractor:		As a joint ventures:	
List of past projects: (Use last page if more room is needed or attach documents as needed)			

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This Statement of Qualifications is offered by:

Business: _____
(typed or printed name of organization)

By: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(date signed)

(If Business is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address for giving notices:

_____

_____

_____

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

_____

_____

_____

Phone: _____

Email: _____

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Years of experience with projects like the proposed project:			
As a general contractor:		As a joint ventures:	
List of past projects:			

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NOTICE OF INTENT TO AWARD

To: _____

_____

_____

Project Description: Robinson-Palestine Water Commission – Water Treatment Plant and Campus

Project No. 0210007.00
Division A: Water Treatment Plant and Campus

The OWNER has considered the BID submitted by you for the above-described WORK, in response to its Advertisement for Bids, dated _____and Information for Bidders.

You are hereby notified that your BID will be accepted, contingent upon Illinois Environmental Protection Agency (IEPA) approval, for items in the amount of $_____

You will be required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR'S Performance BOND, Payment BOND and certificates of insurance within ten (10) calendar days from the date of the final Notice to be sent upon IEPA approval, to you.

Dated this day of _____

Robinson-Palestine Water Commission
OWNER

By: _____

Title: Manager

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

NOTICE OF AWARD

Date of Issuance:

Owner: Robinson-Palestine Water Commission | Owner's Contract No.:

Engineer: Farnsworth Group, Inc. | Engineer's Project No.: 0210007.00

Project: Water Treatment Plant and Campus | Contract Name:

Bidder:

Bidder's Address:

TO BIDDER:

You are notified that Owner has accepted your Bid dated [_____] for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

_____ .

[describe Work, alternates, or sections of Work awarded]

The Contract Price of the awarded Contract is: $_____ *[note if subject to unit prices, or cost-plus]*

Five (5) unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically.

☐ a set of the Drawings will be delivered separately from the other Contract Documents.

You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Deliver to Owner five (5) counterparts of the Agreement, fully executed by Bidder.
2. Deliver with the executed Agreement(s) the Contract security *[e.g., performance and payment bonds]* and insurance documentation as specified in the Instructions to Bidders and General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any):

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner**:** Robinson-Palestine Water Commission

Authorized Signature

By: Jason Wesner

Title: Manager

Copy: Engineer

AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

This Agreement is by and between **Robinson-Palestine Water Commission** ("Owner") and **_____** ("Contractor").

Terms used in this Agreement have the meanings stated in the General Conditions and the Supplementary Conditions.

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

Robinson-Palestine Water Commission – **Water Treatment Plant and Campus**
Division A: Water Treatment Plant and Campus

ARTICLE 2—THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows:

Robinson-Palestine Water Commission – Water Treatment Plant and Campus, Plans and Specifications

Division A: Water Treatment Plant and Campus
Division B: Ground Storage Tanks
Division C: Underground Piping

ARTICLE 3—ENGINEER

3.01 The Owner has retained Farnsworth Group Inc. ("Engineer") to act as Owner's representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

ARTICLE 4—CONTRACT TIMES

4.01 *Time is of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

~~4.02 *Contract Times: Dates.*~~

~~A. The Work will be substantially complete on or before **TBD** and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before **TBD.**~~

EJCDC® C-520, Agreement between Owner and Contractor for Construction Contract (Stipulated Price).
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4.03 *Contract Times: Days*

A. The Work will be substantially complete within **450 days** after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **510 days** after the date when the Contract Times commence to run.

4.04 ~~*Milestones*~~

~~A. Parts of the Work must be substantially completed on or before the following Milestone(s):~~

~~1. Milestone 1 **[event & date/days]**~~

~~2. Milestone 2 **[event & date/days]**~~

~~3. Milestone 3 **[event & date/days]**~~

4.05 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. *Substantial Completion:* Contractor shall pay Owner $250 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.

2. *Completion of Remaining Work:* After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner $250 for each day that expires after such time until the Work is completed and ready for final payment.

3. Liquidated damages for failing to timely attain Milestones, Substantial Completion, and final completion are not additive, and will not be imposed concurrently.

B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

4.06 ~~*Special Damages*~~

~~A. Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.~~

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~~B. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.~~

~~C. The special damages imposed in this paragraph are supplemental to any liquidated damages for delayed completion established in this Agreement.~~

ARTICLE 5—CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:

A. For all Work other than Unit Price Work, a lump sum of $**[number]**.

All specific cash allowances are included in the above price in accordance with Paragraph 13.02 of the General Conditions.

B. ~~For all Unit Price Work, an amount equal to the sum of the extended prices (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item). SEE ATTACHED BID FORM.~~

~~The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 13.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.~~

C. ~~Total of Lump Sum Amount and Unit Price Work (subject to final Unit Price adjustment) $**[number]**.~~

D. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit

ARTICLE 6—PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on the basis of Contractor's Applications for Payment one day each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments

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previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.

a. 10 percent of the value of the Work completed (with the balance being retainage).

1) If 50 percent or more of the Work has been completed, as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and

b. 10 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 90 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 100 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.

6.04 *Consent of Surety*

A. Owner will not make final payment or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

6.05 *Interest*

A. All amounts not paid when due will bear interest at the rate of 0 percent per annum.

ARTICLE 7—CONTRACT DOCUMENTS

7.01 *Contents*

A. The Contract Documents consist of all of the following:

1. This Agreement.
2. Bonds:
   a. Performance bond (together with power of attorney).
   b. Payment bond (together with power of attorney).
3. General Conditions.
4. Supplementary Conditions.
5. Specifications as listed in the table of contents of the project manual (copy of list attached).
6. Drawings consisting of **TBD** sheets with each sheet bearing the following general title: Robinson Palestine Water Commission – Water Treatment Plant and Campus

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7. Drawings listed on the attached sheet index.
8. Addenda (numbers **[0]** to **[0]**, inclusive).
9. Exhibits to this Agreement (enumerated as follows):
10. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
    a. Notice to Proceed.
    b. Work Change Directives.
    c. Change Orders.
    d. Field Orders.
    e. Warranty Bond, if any.

B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 7.

D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 *Contractor's Representations*

A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:

1. Contractor has examined and carefully studied the Contract Documents, including Addenda.
2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. ~~Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.~~
5. ~~Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.~~
6. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical

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Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.

7. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

8. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

9. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

11. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

8.02 *Contractor's Certifications*

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 *Standard General Conditions*

A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has

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furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or “track changes” (redline/strikeout), or in the Supplementary Conditions.

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IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on _____ (which is the Effective Date of the Contract).

Owner:	Contractor:
Robinson-Palestine Water Commission *(typed or printed name of organization)*	_____ *(typed or printed name of organization)*
By: _____ *(individual's signature)*	By: _____ *(individual's signature)*
Date: _____ *(date signed)*	Date: _____ *(date signed)*
Name: Jason Wesner *(typed or printed)*	Name: _____ *(typed or printed)*
Title: Manager *(typed or printed)*	Title: _____ *(typed or printed)* *(If **[Type of Entity]** is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*
Attest: _____ *(individual's signature)*	Attest: _____ *(individual's signature)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)*
Address for giving notices:	Address for giving notices:
_____	_____
_____	_____
_____	_____
Designated Representative:	Designated Representative:
Name: _____ *(typed or printed)*	Name: _____ *(typed or printed)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)*
Address:	Address:
_____	_____
_____	_____
_____	_____
Phone: _____	Phone: _____
Email: _____ *(If **[Type of Entity]** is a corporation, attach evidence of authority to sign. If **[Type of Entity]** is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)*	Email: _____ License No.: _____ *(where applicable)* State: _____

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NOTICE TO PROCEED

Owner:	Robinson-Palestine Water Commission	Owner's Contract No.:	
Contractor:			
Engineer:	Farnsworth Group, Inc.	Engineer's Project No.:	0210007.00
Project:	Water Treatment Plant and Campus	Effective Date of Contract:	

TO CONTRACTOR:

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on

_____, 2026.

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work shall be done at the Site prior to such date. In accordance with the Agreement, the number of days to achieve Substantial Completion is 450 and the number of days to achieve readiness for final payment is 510.

Before starting any Work at the Site, Contractor must comply with the following:

1. Project Progress Schedule
2. Project Schedule of Submittals
3. Attend Pre-Construction Conference

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED
Is hereby acknowledged by:

Robinson-Palestine Water Commission
Owner

Given by:

Authorized Signature	Authorized Signature
Title	Title
Date	Date

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

PERFORMANCE BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER: Robinson-Palestine Water Commission
108 E. Poplar St.
Robinson, IL 62454

CONSTRUCTION CONTRACT
Effective Date of the Agreement:
Amount:
Description: Water Treatment Plant and Campus

BOND
Bond Number:
Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:
Amount:
Modifications to this Bond Form: ☐ None ☐ See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL	**SURETY**
_____ *(seal)*	_____ *(seal)*
Contractor's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	**By:** _____
Signature	Signature *(attach power of attorney)*
_____	_____
Print Name	Print Name
_____	_____
Title	Title
Attest: _____	**Attest:** _____
Signature	Signature
_____	_____
Title	Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than

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the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:

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PAYMENT BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER: Robinson-Palestine Water Commission
108 E. Poplar St.
Robinson, IL 62454

CONSTRUCTION CONTRACT

Effective Date of the Agreement:
Amount:
Description: Water Treatment Plant and Campus

BOND

Bond Number:
Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:
Amount:
Modifications to this Bond Form: ☐ None ☐ See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL	**SURETY**
_____ *(seal)*	_____ *(seal)*
Contractor's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	**By:** _____
Signature	Signature *(attach power of attorney)*
_____	_____
Print Name	Print Name
_____	_____
Title	Title
Attest: _____	**Attest:** _____
Signature	Signature
_____	_____
Title	Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.

5. The Surety's obligations to a Claimant under this Bond shall arise after the following:

    5.1 Claimants who do not have a direct contract with the Contractor,

        5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

        5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).

    5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).

6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

    7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

    7.2 Pay or arrange for payment of any undisputed amounts.

    7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

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12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. **Definitions**

16.1 **Claim:** A written statement by the Claimant including at a minimum:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4 **Owner Default**: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this Bond are as follows:

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ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Contractor's Application for Payment No.

	Application Period:	Application Date:
To (Owner): Robinson-Palestine Water Commission	From (Contractor):	Via (Engineer): Farnsworth Group, Inc.
Project: Water Treatment Plant and Campus	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.: 210007.00

Application For Payment

Change Order Summary

Approved Change Orders		
Number	Additions	Deductions
TOTALS		
NET CHANGE BY CHANGE ORDERS		

1. ORIGINAL CONTRACT PRICE	**$**
2. Net change by Change Orders	**$**
3. Current Contract Price (Line 1 ± 2)	**$**
4. TOTAL COMPLETED AND STORED TO DATE (Column F total on Progress Estimates)	**$**
5. RETAINAGE:	
a. X _____ Work Completed	**$**
b. X _____ Stored Material	**$**
c. Total Retainage (Line 5.a + Line 5.b)	**$**
6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5.c)	**$**
7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)	**$**
8. AMOUNT DUE THIS APPLICATION	**$**
9. BALANCE TO FINISH, PLUS RETAINAGE (Column G total on Progress Estimates + Line 5.c above)	**$**

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:
(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;
(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all Liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such Liens, security interest, or encumbrances); and
(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor Signature

By:	Date:

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is recommended by: _____ _____
(Engineer) (Date)

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is approved by: _____ _____
(Owner) (Date)

Approved by: _____ _____
Funding or Financing Entity (if applicable) (Date)

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Progress Estimate - Lump Sum Work

Contractor's Application

For (Contract): Robinson-Palestine Water Commission - Water Treatment Plant and Campus	Application Number:
Application Period:	Application Date:

			Work Completed		E	F		G
A		B	C	D				
Specification Section No.	Description	Scheduled Value ($)	From Previous Application (C+D)	This Period	Materials Presently Stored (not in C or D)	Total Completed and Stored to Date (C + D + E)	% (F / B)	Balance to Finish (B - F)

Progress Estimate - Unit Price Work

Contractor's Application

For (Contract): Robinson-Palestine Water Commission - Water Treatment Plant and Campus								Application Number:			
Application Period:								Application Date:			
A					B	C	D	E	F		
Item		Contract Information				Estimated Quantity Installed	Value of Work Installed to Date	Materials Presently Stored (not in C)	Total Completed and Stored to Date (D + E)	% (F / B)	Balance to Finish (B - F)
Bid Item No.	Description	Item Quantity	Units	Unit Price	Total Value of Item ($)						
	Totals										

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Stored Material Summary

Contractor's Application

For (Contract): Robinson-Palestine Water Commission - Water Treatment Plant and Campus								Application Number:			
Application Period:								Application Date:			
A		B	C		D		E		F		G
Bid Item No.	Supplier Invoice No.	Submittal No. (with Specification Section No.)	Storage Location	Description of Materials or Equipment Stored	Stored Previously		Amount Stored this Month ($)	Subtotal Amount Completed and Stored to Date (D + E)	Incorporated in Work		Materials Remaining in Storage ($) (D + E - F)
					Date Placed into Storage (Month/Year)	Amount ($)			Date (Month/ Year)	Amount ($)	
				Totals							

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ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:	Robinson-Palestine Water Commission	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	Farnsworth Group, Inc.	Engineer's Project No.:	0210007.00
Project:	Water Treatment Plant and Campus	Contract Name:	

This [preliminary] [final] Certificate of Substantial Completion applies to:

☐ All Work ☐ The following specified portions of the Work:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work shall be as provided in the Contract, except as amended as follows: *[Note: Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.]*

Amendments to Owner's responsibilities: ☐ None ☐ As follows

Amendments to Contractor's responsibilities: ☐ None ☐ As follows:

The following documents are attached to and made a part of this Certificate: *[punch list; others]*

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract.

EXECUTED BY ENGINEER:	RECEIVED:	RECEIVED:
By: _____ (Authorized signature)	By: _____ Owner (Authorized Signature)	By: _____ Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____

Equipment Manufacturer Program Certification

The Water Treatment Process Equipment including, but not limited to, Decelerating Gravity Media Filters, Per- and Polyfluoroalkyl Substances (PFAS) removal gravity contact beds, Chemical Storage and Delivery system, and intermediate pumps and related accessories and appurtenances specified in Division 46 of these Contract Documents will be monitored and controlled by the local PLC and local HMI as well as the Robinson-Palestine Water Commission's Water Treatment Plant Facility SCADA. The Facility Systems Integrator will utilize the Treatment Equipment Manufacturer's programming used in the Chlorine Control Panel as part of the monitoring and control system specified in Division 40. To achieve this the Facility System Integrator will need full access to all programming and information. The Facility System Integrator and the Robinson-Palestine Water Commission will not use this information for any purpose outside of the proposed project.

The following information will be provided by the Treatment Equipment Manufacturer whose equipment is provided for this project. Failure to provide any of the required information shall disqualify the Equipment Manufacturer from consideration on this project.

- Submit complete programming documentation for each programmable logic controller (PLC) on flash drive or cloud storage. Documentation shall include fully annotated reports and description comments. Full sequence of operation shall be contained in running comments. Description and reports shall be cross-referenced. All PLC programs shall be provided in native electronic Studio 5000 file format. Each file shall be the complete, modifiable program with no passwords or other restrictions for future access and/or modifications in any way. This includes any code source protections on custom data types, ladder logic, structured text, function blocks, add-on instruction or other code to the program. Any similar restrictions are also not acceptable.

- Provide copy of any Human Machine Interface (HMI) program file in native electronic format (.mer, .apa, appropriate root folder, etc.). No HMI program shall have password protection or access restriction from future editing. Equipment Manufacturer required to provide detailed excel spreadsheet that maps HMI tag name, description of the tag, and tag address in the PLC for all tags within the HMI. Coordinate with the Facility System Integrator to provide information and documents listed in Specification 40 90 50 Section 1.7.C as well as adhere to all Specification sections 40 90 00 - 40 90 50.

A qualified representative from the Treatment Equipment Manufacturer must sign below in acknowledgement and agreement to these terms. This form is to be provided as part of the bidding documents.

_____	_____
Printed Name/Title	Company
_____	_____
Signature	Date

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Timetables	Goals for minority participation for each trade	Goals for female participation in each trade
	Insert goals for* each year 2.5	Insert goals for* each year 6.9

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.

4. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is **.

*goals and timetables published from time to time by the Director, Office of Federal Contract Compliance Programs (OFCCP)

**Insert description of the geographical areas where the contract is to be performed giving the state, county and city, if any.

CONSTRUCTION CONTRACTORS AFFIRMATIVE ACTION REQUIREMENTS GOALS FOR MINORITY PARTICIPATION

(As published in the Friday, October 3, 1980 Federal Register)

FEMALE PARTICIPATION= 6.9% STATEWIDE

County	Percent	County	Percent	County	Percent
Adams	3.1	Jasper	11.4	Randolph	11.4
Alexander	11.4	Jefferson	11.4	Richland	11.4
Bond	11.4	Jersey	11.4	Rock Island	4.6
Boone	6.3	Jo Davis	0.5	Saline	3.5
Brown	3.1	Johnson	11.4	Sangamon	4.5
Bureau	18.4	Kane	19.6	Schuyler	3.3
Calhoun	11.4	Kankakee	9.1	Scott	4
Carroll	3.4	Kendall	18.4	Shelby	4
Cass	4	Knox	3.3	Stark	3.3
Champaign	7.8	Lake	19.6	St. Clair	14.7
Christian	4	La Salle	18.4	Stephenson	4.6
Clark	2.5	Lawrence	3.5	Tazwell	4.4
Clay	11.4	Lee	4.6	Union	11.4
Clinton	14.7	Livingston	18.4	Vermilion	4.8
Coles	4.8	Logan	4	Wabash	3.5
Cook	19.6	Macon	7.6	Warren	3.3
Crawford	2.5	Macoupin	11.4	Washington	11.4
Cumberland	4.8	Madison	14.7	Wayne	11.4
De Kalb	18.4	Marion	11.4	White	3.5
De Witt	4	Marshall	3.3	Whiteside	3.4
Douglas	4.8	Mason	3.3	Will	20.9
Du Page	19.6	Massac	5.2	Williamson	11.4
Edgar	4.8	McDonough	3.3	Winnebago	6.3
Edwards	3.5	McHenry	19.6	Woodford	4.4
Effingham	11.4	McLean	2.5		
Fayette	11.4	Menard	4.5		
Ford	4.8	Mercer	3.4		
Franklin	11.4	Monroe	14.7		
Fulton	3.3	Montgomery	11.4		
Gallatin	3.5	Morgan	4		
Greene	11.4	Moultrie	4		
Grundy	18.4	Ogle	4.6		
Hamilton	3.5	Peoria	4.4		
Hancock	3.4	Perry	11.4		
Hardin	5.2	Piatt	4.8		
Henderson	3.4	Pike	3.1		
Henry	4.6	Pope	5.2		
Iroquois	18.4	Pulaski	11.4		
Jackson	11.4	Putnam	18.4		

41 CFR 60

60-4.1 Scope and Application.

This part applies to all contractors and subcontractors that hold any Federal or federally assisted construction contract in excess of $10,000. The regulations in this part are applicable to all of a construction contractor's or subcontractor's construction employees who are engaged in on site construction including those construction employees who work on a non-Federal or non- federally assisted construction site. This part also establishes procedures, which all Federal contracting officers and all applicants, as applicable, shall follow in soliciting for and awarding Federal or federally assisted construction contracts. Procedures also are established which administering agencies shall follow in making any grant, contract, loan, insurance, or guarantee involving federally assisted construction which is not exempt from the requirements of Executive Order 11246, as amended. In addition, this part applies to construction work performed by construction contractors and subcontractors for Federal non-construction contractors and subcontractors if the construction work is necessary in whole or in part to the performance of a non-construction contract or subcontract.

[43 FR 49254, OCT. 20, 1978; 43 FR 51404, NOV. 3, 1978]

60-4.2 Solicitations.

(a) All Federal contracting officers and all applicants shall include the notice set forth in paragraph (d) of this section and the Standard Federal Equal Employment Opportunity Construction Contract Specifications set forth in § 60-4.3 of this part in all solicitations for offers and bids on all Federal and federally assisted construction contracts or subcontracts to be performed in geographical areas designated by the Director pursuant to § 60-4.6 of the part. Administering agencies shall require the inclusion of the notice set forth in paragraph (d) of this section and the specifications set forth in § 60-4.3 of this part as a condition of any grant, contract, subcontract, loan, insurance or guarantee involving federally assisted construction covered by this Part 60-4.

(b) All non-construction contractors covered by Executive Order 11246 and the implementing regulations shall include the notice in paragraph (d) of this section in all construction agreements, which are necessary in whole or in part to the performance of the covered non- construction contract.

(c) Contracting officers, applicants and non-construction contractors shall give written notice to the Director within 10 working days of award of a contract subject to these provisions. The notification shall include the name, address and telephone number of the contractor; employer identification number; dollar amount of the contract, estimated starting and completion dates of the contract; the contract number; and geographical area in which the contract is to be performed.

(d) The following notice shall be included in, and shall be a part of, all solicitations for offers and bids on all Federal and federally assisted construction contracts or subcontracts in excess of $10,000 to be performed in geographical areas designated by the Director pursuant to § 60-4.6 of this part (see 41 CFR 60-4.2(a)):

Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246)

1. The Offeror or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Time-tables	Goals for minority female participation for each trade	Goals for participation in each trade
	6.9%	2.5%

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is (insert description of the geographical areas where the contract is to be performed giving the state, county and city, if any).

[43 FR 49254, OCT. 20, 1978; 43 FR 51401, NOV. 3, 1978, AS AMENDED AT 45 FR 65977, OCT. 3, 1980]

60-4.3 Equal Opportunity Clauses.

(a) The equal opportunity clause published at 41 CFR 60-1.4(a) of this chapter is required to be included in, and is part of, all nonexempt Federal contracts and subcontracts, including construction contracts and subcontracts. The equal opportunity clause published at 41 CFR 60-1.4(b) is required to be included in, and is a part of, all nonexempt federally assisted construction contracts and subcontracts. In addition to the clauses described above, all Federal contracting officers, all applicants and all non-construction contractors, as applicable, shall include the specifications set forth in this section in all Federal and federally assisted construction contracts in excess of $10,000 to be performed in geographical areas designated by the Director pursuant to § 60-4.6 of this part and in construction subcontracts in excess of $10,000 necessary in whole or in part to the performance of non-construction Federal contracts and subcontracts covered under the Executive order.

Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246)

1. As used in these specifications:

a. "Covered area," means the geographical area described in the solicitation from which this contract resulted:

b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;

c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.

d. "Minority" includes:

(i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

(ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);

(iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

(iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals

for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7 a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered Construction contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, nor the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, the Contractor must employ such apprentices and trainees during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative action to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The

Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore; along with whatever additional actions the Contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with onsite supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written

notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisors' adherence toand performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the

Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws, which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

(b) The notice set forth in 41 CFR 60-4.2 and the specifications set forth in 41 CFR 60-4.3 replace the New Form for Federal Equal Employment Opportunity Bid Conditions for Federal and Federally Assisted Construction published at 41 FR 32482 and commonly known as the Model Federal EEO Bid Conditions, and the New Form shall not be used after the regulations in 41 CFR Part 60-4 become effective.

[43 FR 49254, OCT. 20, 1978; 43 FR 51401, NOV. 3, 1978, AS AMENDED AT 45 FR 65978, OCT. 3, 1980]

60-4.4 Affirmative Action Requirements.

(a) To implement the affirmative action requirements of Executive Order 11246 in the construction industry, the Office of Federal Contract Compliance Programs previously has approved affirmative action programs commonly referred to as "Hometown Plans," has promulgated affirmative action plans referred to as "Imposed Plans" and has approved "Special Bid Conditions" for high impact projects constructed in areas not covered by a Hometown or an Imposed Plan. All solicitations for construction contracts made after the effective date of the regulations in this part shall include the notice specified in § 60-4.2 of this part and the specifications in § 60-4.3 of this part in lieu of the Hometown and Imposed Plans including the Philadelphia Plan and Special Bid Conditions. Until the Director has issued an order pursuant to § 60-4.6 of this part establishing goals and timetables for minorities in the appropriate geographical areas or for a project covered by Special Bid Conditions, the goals and timetables for minorities to be inserted in the Notice required by 41 CFR 60-4.2 shall be the goals and timetables contained in the Hometown Plan, Imposed Plan or Special Bid Conditions presently covering the respective geographical area or project involved.

(b) Signatories to a Hometown Plan (including heavy highway affirmative action plans) shall have 45 days from the effective date of the regulations in this part to submit under such a Plan (for the director's approval) goals and timetables for women and to include female representation on the Hometown Plan Administrative Committee. Such goals for female representation shall be at least as high as the goals established for female representation in the notice issued pursuant to 41 CFR 60-4.6. Failure of the signatories, within the 45-day period, to include female representation and to submit goals for women or a new plan, as appropriate, shall result in an automatic termination of the Office of Federal Contract Compliance Program's approval of the Hometown Plan. At any time the Office of Federal Contract Compliance Programs terminates or withdraws its approval of a Hometown Plan, or when the plan expires and another plan is not approved, the contractors signatory to the plan shall be covered automatically by the specifications set forth in § 60-4.3 of this part and by the goals and timetables established for that geographical area pursuant to § 60-4.6 of this part.

60-4.5 Hometown Plans

(a) A contractor participating, either individually or through an association, in an approved Hometown Plan (including heavy highway affirmative action plans) shall comply with its affirmative action obligations under Executive Order 11246 by complying with its obligations under the plan: *Provided,* That each contractor or subcontractor participating in an approved plan is individually required to comply with the equal opportunity clause set forth in 41 CFR 60-1.4; to make a good faith effort to achieve the goals for each trade participating in the plan in which it

has employees; and that the overall good performance by other contractors or subcontractors toward a goal in an approved plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the plan's goals and timetables. If a contractor is not participating in an approved Hometown Plan it shall comply with the specifications set forth in § 60-4.3 of this part and with the goals and timetables for the appropriate area as listed in the notice required by 41 CFR 60-4.2 with regard to that trade. For the purposes of this part 60-4, a contractor is not participating in a Hometown Plan for a particular trade if it:

(1) Ceases to be signatory to a Hometown Plan covering that trade;

(2) Is signatory to a Hometown Plan for that trade but is not party to a collective bargaining agreement for that trade;

(3) Is signatory to a Hometown Plan for that trade but is party to a collective bargaining agreement with labor organizations, which are not or cease to be signatories to the same Hometown Plan for that trade;

(4) Is signatory to a Hometown Plan for that trade but is party to a collective bargaining agreement with a labor organization for that trade but the two have not jointly executed a specific commitment to minority and female goals and timetables and incorporated the commitment in the Hometown Plan for that trade;

(5) Is participating in a Hometown Plan for that trade which is no longer acceptable to the Office of Federal Contract Compliance Programs;

(6) Is signatory to a Hometown Plan for that trade but is party to a collective bargaining agreement with a labor organization for that trade and the labor organization and the contractor have failed to make a good faith effort to comply with their obligations under the Hometown Plan for that trade.

(b) Contractors participating in Hometown Plans must be able to demonstrate their participation and document their compliance with the provision of the Hometown Plan.

[43 FR 49254, OCT. 20, 1978; 43 FR 51401, NOV. 3, 1978]

60-4.6 Goals and Timetables.

The Director, from time to time, shall issue goals and timetables for minority and female utilization, which shall be based on appropriate workforce, demographic, or other relevant data and which shall cover construction projects or construction contracts performed in specific geographical areas. The goals, which shall be applicable to each construction trade in a covered contractor's or subcontractor's entire workforce which is working in the area covered by the goals and timetables, shall be published as notices in the Federal Register, and shall be inserted by the contracting officers and applicants, as applicable, in the Notice required by 41 CFR 60-4.2. Covered construction contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed.

[45 FR 65978, OCT. 3, 1980]

60-4.7 Effect on Other Regulations.

The regulations in this part are in addition to the regulations contained in this chapter, which apply to construction contractors and subcontractors generally. See particularly, 41 CFR 60-1.4 (a), (b), (c), (d), and (e); 60-1.5; 60-1.7; 60-1.8; 60-1.26; 60-1.29; 60-1.30; 60-1.32; 60-1.41; 60-1.42; 60-1.43; and 41 CFR Part 60-3; Part 60-20; Part 60-30; Part 60-40; and Part 60-50.

60-4.8 Show Cause Notice.

If an investigation or compliance review reveals that a construction contractor or subcontractor has violated the Executive order, any contract clause, specifications or the regulations in this chapter and if administrative enforcement is contemplated, the Director shall issue to the contractor or subcontractor a notice to show cause which shall contain the items specified in paragraphs (i) through (iv) of 41 CFR 60-2.2(c)(1). If the contractor does not show good cause within 30 days, or in the alternative, fails to enter an acceptable conciliation agreement which includes where appropriate, make up goals and timetables, back pay, and seniority relief for affected class members, the OFCCP shall follow the procedure in 41 CFR 60-1.26(b): *Provided,* That where a conciliation agreement has been violated, no show cause notice is required prior to the initiation of enforcement proceedings.

[43 FR 49254, OCT. 20, 1978; 43 FR 51401, NOV. 3, 1978]

60-4.9 Incorporation by Operation of the Order.

By operation of the order, the equal opportunity clause contained in § 60-1.4, the Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246) contained in § 60-4.2, and the Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246) contained in § 60-4.3 shall be deemed to be a part of every solicitation or of every contract and subcontract, as appropriate, required by the order and the regulations in this chapter to include such clauses whether or not they are physically incorporated in such solicitation or contract and whether or not the contract is written.

U.S. ENVIRONMENTAL PROTECTION AGENCY

CERTIFICATION OF NONSEGREGATED FACILITIES

(Applicable to federally assisted construction contracts and related subcontracts exceeding $10,000 that are not exempt from the Equal Opportunity clause.)

The federally assisted construction contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally assisted construction contractor certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom or otherwise. The federally assisted construction contractor agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause, and that he will retain such certification in his files.

_____

Signature Date

_____

Name and Title of Signer (Please type)

_____

Firm Name

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

NOTICE TO LABOR UNIONS OR OTHER ORGANIZATIONS OF WORKERS

NONDISCRIMINATION IN EMPLOYMENT

To: _____
(Name of union or organization of workers)

The undersigned currently holds contract(s) with _____
(name of applicant)
involving funds or credit of the U.S. Government or (a) subcontract(s) with a prime contractor holding such contract(s).

You are advised that under the provisions of the above contracts(s) or subcontract(s) and in accordance with Executive Order 11246, as amended, dated September 24, 1965, as amended, the undersigned is obliged not to discriminate against any employee or applicant for employment because of race, color, creed or national origin. This obligation not to discriminate in employment includes, but is not limited to, the following:

HIRING, PLACEMENT, UPGRADING, TRANSFER OR DEMOTION, RECRUITMENT, ADVERTISING, OR SOLICITATION FOR EMPLOYMENT, TRAINING DURING EMPLOYMENT, RATES OF PAY OR OTHER FORMS OF COMPENSATION, SELECTION FOR TRAINING INCLUDING APPRENTICESHIP, LAYOFF OR TERMINATION.

This notice is furnished you pursuant to the provisions of the above contract(s) or subcontracts(s) and Executive Order 11246, as amended.

Copies of this notice will be posted by the undersigned in conspicuous places available to employees or applicants for employment.

_____

_____

_____

_____
(Contractor or Subcontractor)

_____
(Date)

EPA Project Control #: 0210007.00

United States Environmental Protection Agency
Washington, DC 20460

Certification Regarding Debarment, Suspension and Other Responsibility Matters

The prospective participant to the best of its knowledge and belief that it and its principles:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1) (b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in fine of up to $10,000 or imprisonment for up to 5 years, or both.

_____
(Typed Name & Title of Authorized Representative)

_____
(Signature of Authorized Representative) (Date)

_____

☐ I am unable to certify the above statements. My explanation is attached.

EPA FORM 5700-49 (11-88)

Instructions

Under Executive Order 12549 an individual or organization debarred or excluded from participation in Federal assistance or benefit programs may not receive any assistance award under a Federal program, or a sub-agreement thereunder for $25,000 or more.

Accordingly, each prospective recipient of an EPA grant, loan, or cooperative agreement and any contract or sub-agreement participant thereunder must complete the attached certification or provide an explanation why they cannot. For further details, see 40 CFR 32.510, Participants' responsibilities, in the attached regulation.

Where to Submit

The prospective EPA grant, loan, or cooperative agreement recipient must return the signed certification or explanation with its application to the appropriate EPA Headquarters or Regional office, as required in the application instructions.

A prospective prime contractor must submit a completed certification or explanation to the individual or organization awarding the contract.

Each prospective subcontractor must submit a completed certification or explanation to the prime contractor for the project.

How to Obtain Forms:

EPA includes the certification form, instructions, and a copy of its implementing regulation (40 CFR Part 32) in each application kit. Applicants may reproduce these materials as needed and provide them to their prospective prime contractor, who, in turn, may reproduce and provide them to prospective subcontractors.

Additional copies/assistance may be requested from:

Compliance Branch
Grants Administration Division (PM-216F)
U.S. Environmental
Protection Agency 401 M
Street, SW
Washington DC 20460
(Telephone: 202-475-8025)

EPA Form 5700-19 (11-88)

Construction Contracts of Loan Recipient and Other Sections From "Procedures for Issuing Loans from the Water Pollution Control Loan Program"

Section 365.420(b)(2) Change Orders

A) When the loan recipient authorizes the contractor to add, delete, or revise the work within the general scope of the contract documents, or authorizes an adjustment in the contract price or contract time, the loan recipient shall submit a change order to the Agency.

B) For each change order, the loan recipient shall submit to the Agency for approval the following documentation:

i) one copy of the fully executed change order signed by the loan recipient, construction engineer, and the contractor; and

ii) a description of any changes, with justification for the changes.

C) Prior approval by the Agency of a change order is required when a change order results in:

i) alterations in design scope that require a modification to a construction permit; or

ii) an increase in the amount of loan funds needed to complete the project.

D) Failure to give timely notice of proposed project changes or action by the loan recipient that is not consistent with the Agency's determination on those changes may result in disallowance of loan participation for costs incurred that are attributable to the change.

Section 365.620(I) Required Construction Contract Provisions

Each construction contract shall include the following provisions:

1) Audit; access to records:

A) The contractor shall maintain books, records, documents and other evidence directly pertinent to performance on loan work in accordance with Generally Accepted Accounting Principles (GAAP). The contractor shall also maintain the financial information and data used by the contractor in the preparation or support of any cost submissions required under Section 365.420 (b)(2) of the loan rules and a copy of the cost summary submitted to the owner. The Illinois Auditor General, the owner, the Agency, or any of their authorized representatives shall have access to the books, records, papers, documents, and other evidence for purposes of inspection, audit, examination, excerpts, transcriptions, and copying. The contractor shall provide facilities for access and inspection.

B) For a formally advertised, competitively awarded, fixed price contract, the contractor shall include access to records as required by subsection (a)(1)(A) of the loan rules for all negotiated change orders and contract amendments in excess of $25,000 that affect the contract price. In the case of all other prime contracts, the contractor shall agree to include access to records required by subsection (a)(1)(A) in all contracts and all tier subcontracts or change orders in excess of $25,000 that are directly related to project performance.

C) Audits shall be in accordance with auditing standards generally accepted in the United States.

D) The contractor shall agree to the disclosure of all information and reports resulting from access to records required by subsection (a)(1)(A). When the audit concerns the contractor, the auditing agency shall afford the contractor an opportunity for an audit exit conference and an opportunity to comment on the pertinent portions of the draft audit report. The final audit report shall include the written comments, if any, of the audited parties.

E) The records required by subsection (a)(1)(A) shall be maintained and made available during performance of the work under the loan agreement and for 3 years after the date of the final loan audit. In addition, records that relate to any dispute or litigation or the settlement of claims arising out of any performance, costs or items to which an audit exception has been taken, shall be maintained and made available for 3 years after resolution of the dispute, appeal, litigation, claim or exception.

F) The right of access will generally be exercised with respect to financial records under:

i) Negotiated prime contracts;

ii) Negotiated change orders or contract amendments in excess of $25,000 affecting the price of any formally advertised, competitively awarded, fixed price contract; and

iii) Subcontracts or purchase orders under any contract other than a formally advertised, competitively awarded, fixed price contract.

G) The right of access will generally not be exercised with respect to a prime contract, subcontract, or purchase order awarded after effective price competition. In any event, the right of access shall be exercised under any type of contract or subcontract:

i) With respect to records pertaining directly to contract performance, excluding any financial records of the contractor; and

ii) If there is any indication that fraud, gross abuse, or corrupt practices may be involved in the award or performance of the contract or subcontract.

2) Covenant against contingent fees.

The contractor shall warrant that no person or selling agency has been employed or retained to solicit or secure the contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee. For breach or violation of this warranty, the owner shall have the right to annul the contract without liability or in its discretion to deduct from the contract price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

3) Wage provisions.

The Contractor shall pay prevailing wages in accordance with the Davis-Bacon Act (40 USC 3141 through 3148) as defined by the U.S. Department of Labor.

4) Disadvantaged business enterprise requirements.

The contractor shall provide evidence that the contractor has taken affirmative steps in accordance with 40 CFR 33 to assure that disadvantaged business enterprises are used when possible as sources of supplies, equipment, construction, and services, consistent with the provisions of the Agency's Operating Agreement with USEPA.

5) Debarment and suspension provisions.

The contract shall require the successful bidders to submit a Certificate Regarding Debarment, Suspension and Other Responsibility Matters (EPA Form 5700-49) showing compliance with federal Executive Order 12549.

6) Nonsegregated facilities provisions

The contractor shall be required to submit a Certification of Nonsegregated Facilities on forms provided by the Agency.

7) American Iron and Steel

The contractor shall be required to use American Iron and Steel, if required by USEPA for that fiscal year.

8) A clause that provides:

"No contractor or subcontractor shall discriminate on the basis of race, color, national origin or sex in the performance of this contract. The contractor or subcontractor shall carry out applicable requirements of 40 CFR 33 in the award and administration of contracts awarded under the WPCLP. Failure by the contractor or subcontractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies."

Section 365.620(g) Subcontracts Under Construction Contracts

The award or execution of all subcontracts by a prime contractor and the procurement and negotiation procedures used by the prime contractor shall comply with:

1) All applicable provisions of federal, State and local law;

2) All provisions of Part 365 regarding fraud and other unlawful or corrupt practices;

3) All provisions of Part 365 with respect to access to facilities, records and audit of records; and

4) All provisions of subsection 365.620(f)(5) that require a Certification Regarding Debarment, Suspension, and Other Responsibility Matters (EPA Form 5700-49) showing compliance with any controlling federal Executive Orders.

Section 365.620(h) Contractor Bankruptcy

In the event of a contractor bankruptcy, the loan recipient shall notify the Agency and shall keep the Agency advised of any negotiations with the bonding company, including any proposed settlement. The Agency may participate in those negotiations and will advise the loan recipient of the impact of any proposed settlement to the loan agreement. The loan recipient shall be responsible for assuring that every appropriate procedure and incidental legal requirement is observed in advertising for bids and re-awarding a construction contract.

Section 365.620(i) Access

Every contract entered by the loan recipient for construction work, and every subagreement, shall provide the Agency representatives with access to the work. The contractor or subcontractor shall provide facilities for such access and inspection.

Section 365.640(c) Remedies

All claims, counter-claims, disputes and other matters in question between the recipient and the contractor arising out of, or relating to, a subagreement or its breach shall be decided by arbitration if the parties agree, or in a court of competent jurisdiction within the State.

Bidder Certification
In Compliance with
Article 33E-11 to the
"Criminal Code of 2012"

I_____, do hereby certify that:
Name

1. I am_____of the _____
Position Firm
and have authority to execute this certification on behalf of the firm

2. This firm is not barred from bidding on this contract due to a either a Bid-rigging or Bid Rotating violation as set forth in Article 33E-11 to the "Illinois Criminal Code of 2012 [720 ILCS 5/33E- 11]."

Name of Firm _____

Signature _____

Title _____

Date_____ Corporate Seal (where appropriate)

On this_____day of_____20_____, before me appeared (Name)

_____ to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (Name of Firm)_____to execute the affidavit and did so as his or her free act and deed.

Notary Public_____Commission Expires _____

Notary Seal

Specifications for Disadvantaged Business Enterprise Participation

(Name of Loan Recipient) **Robinson-Palestine Water Commission**

I. Disadvantaged Business Enterprise Policy

A. It is the policy of the State of Illinois to award a fair share of sub-agreements to disadvantaged businesses (DBEs). In complying with this requirement, contractors are required to take affirmative steps to assure that disadvantaged businesses are used when possible as sources of supplies, equipment, construction, and services as explained herein.

B. These specifications define the terms, conditions, and requirements of the State Revolving Fund Loan Program, and the (Name of Loan Recipient) **Robinson-Palestine Water Commission's** and procedures for complying with these requirements. policy

C. As required by the award conditions of USEPA's Assistance Agreement with IEPA, the fair share percentages are 2.5% for MBEs and 6.9% for WBEs.

II. Pre-Contract Award Obligations

A. All bidders are required to advertise subcontracting opportunities and to negotiate with disadvantaged businesses prior to bid opening. Failure to document such affirmative efforts shall be deemed, relative to disadvantaged business compliance, non-responsive.

B. To establish a bid as responsible, the bidder will be required to document the proposed utilization of disadvantaged businesses with letters of intent signed by the bidder and by the disadvantaged business listed in the bid. The documentation requirements are outlined in Section III of this document.

C. (Name of Loan Recipient) **Robinson-Palestine Water Commission's** disadvantaged business policy clearly intends for bidders to contact and encourage the participation of disadvantaged businesses prior to bid opening. Affirmative efforts (the written record of conscientious and honest communications between the bidder and disadvantaged business) must be initiated and completed by the bidder prior to bid opening. All bidders must document compliance with the requirements of the disadvantaged business policy.

III. Evaluation of Disadvantaged Business Utilization and Affirmative Efforts

A. As a prerequisite to demonstrate compliance with the (Name of Loan Recipient) **Robinson-Palestine Water Commission's** disadvantaged business policy, ALL bidders shall provide the following with its bid:

1. Completed and signed certification from the bidder(s), attesting that the bidder will award no sub-agreements, including the procurement of equipment, materials, supplies and services, in the performance of this contract.

OR

2. "Certification of publication," or adequate proof of publication, including an actual copy of the newspaper advertisement from a daily newspaper. The advertisement must run one day at least (16) days prior to bid opening. An example advertisement follows this section.

   Bidders may publish the advertisement in an established, online bidder's clearinghouse such as the "Dodge Report (http://construction.com/dodge/)". If an online advertisement is placed with the "Dodge Report" or an equivalent website, a screenshot of the advertisement along with the webpage address, and a payment receipt is required as documentation. The advertisement must run one day at least (16) days prior to **bid opening.**

3. List of all disadvantaged business enterprise (DBE) and non-DBE's that submitted proposals to the bidder along with the date of the proposal. Names, addresses, phone number and/or e-mail are required.

4. List of disadvantaged businesses not being utilized and justification for non- utilization.

5. If DBE subcontractors will be utilized for the project, a completed and signed copy of IEPA DBE Form No. 3 (DBE Subcontractor Utilization Form) or an equivalent "Notice of Intent" is needed from each subcontractor.

6. If DBE subcontractors will be utilized for the project, a completed and signed certification from the bidder(s), attesting that the bidder has no controlling or dominating interest or conflict of interest with the disadvantaged business that will be utilized.

7. In instances where the bidder(s) does not receive any proposals from disadvantaged businesses prior to bid opening, the bidder(s) must provide a written certification attesting that no proposals were received.

Failure to submit the documentation pursuant to the requirements of A (1-7) above may cause rejection of the bid as non-responsive.

IV. Sanctions

A. The (Name of Loan Recipient) **Robinson-Palestine Water Commission** may reject one or all bids when the information submitted by the bidder(s) fails to demonstrate compliance with the disadvantaged business requirements (i.e., the bidder fails to place their pre-bid advertisement in a daily newspaper, or approved website, at least 16 days prior to bid opening).

B. Upon finding that any Party has not complied with the requirements of these specifications, including misrepresenting a firm as a disadvantaged business, any one or a combination of the following actions may be taken.

1. Declare the bidder and/or subcontractor non-responsible and therefore, ineligible for contract award.

2. Disallow all contract costs associated with non-compliance.

3. Refer matters which may be fraudulent to the Illinois Attorney General.

V. Post-Contract Award Compliance

A. As required by the award conditions of USEPA's Assistance Agreement with IEPA, all sub-agreements of the prime contractor must identify that the fair share percentages are 2.5% for MBEs and 6.9 % for WBEs.

B. After award of the prime contract, copies of all disadvantaged business-related sub- agreements between the prime contractor and subcontractors shall be submitted to the owner.

C. After bid submission, any changes in previously reported disadvantaged businesses utilization shall be handled in accordance with 40 CFR Part 33.302(b-h). If the contractor fails to initiate such actions, the owner may withhold payments and/or institute other appropriate sanctions.

Suggested Disadvantaged Business (DBE)
Advertisement for Construction Contractors

Notice to Disadvantaged Businesses

_____

(Name of Company) (Address of Company) (Telephone)

seeking disadvantaged businesses for the

ROBINSON-PALESTINE WATER COMMISSION_____
(Name of Loan Recipient)

Project for subcontracting opportunities in the following areas:

_____

All disadvantaged businesses should contact, IN WRITING, (certified letter, return receipt requested), _____to discuss the subcontracting opportunities.
(Company Contact Person)

All negotiation must be completed prior to bid opening _____
(Date of Bid Opening)

*The advertisement must clearly state the method of evaluating the proposals or quotations, and the relative importance attached to each criterion. Bidders must uniformly and objectively evaluate the proposals submitted by disadvantaged business in response to the advertisement based upon the evaluation criteria stated in the advertisement. The evaluation criteria must not be restrictive or exclusionary.

Summary Report of Disadvantaged Business Enterprise Requirements for Contractors

1) Completed and signed certification from bidder(s), attesting that the bidder will award no sub-agreements, including the procurement of equipment, materials, supplies and services in the performance of this contract (may use IEPA DBE Form #1).

OR

"Certificate of publication, or adequate evidence of proof of publication, including an actual copy of the newspaper advertisement from a daily publication. For advertisements placed in a construction project clearinghouse such as www.construction.com, a screenshot of the advertisement, link to website, and receipt is required for proof of advertising.

2) List of all disadvantaged business enterprises (DBE) and non-DBE's that submitted proposals to the bidder/prime contractor. Specify as DBE or non-DBE, type of DBE, and the other information listed below (DBE Form #4 may be used for this purpose).

Name of Company
Name of Owners
Address of Company
E-mail Address of Company
Telephone Number
Date of Proposal
Type of Business
Type of DBE
Description of work to be performed

3) List of disadvantaged businesses that submitted proposals to the bidder but will not be utilized. Justification for non-utilization must be provided (may use IEPA DBE Form #i)

4) Completed and signed copies IEPA DBE Form #3 (Subcontractor Utilization Form) or equivalent "Notice of Intent". Only applies if using DBE subcontractors.

5) Completed and signed certification from bidder(s) attesting that the bidder has no dominating or conflict of interest with the disadvantaged business to be utilized (IEPA DBE Form #1). Only applies if using DBE subcontractors.

6) In instances where the bidder(s) does not receive any proposals from disadvantaged businesses prior to bid opening, the bidder(s) must provide a written certification attesting that no proposals were received (IEPA DBE Form Al).

7) Note: DBE Form #2 is not included in this packet. It is for consultants/engineers to report DBE activity. This form may be found in IEPA's DBE Guidance Manual which is available on the Agency's website or mailed upon request by calling 217-782-2027.

IEPA Disadvantaged Business Enterprise (DBE) Program Form #1
Contractor Certification Form

(To be completed by all Prime Contractors)

Please check the appropriate boxes that apply and complete the information on the bottom of the form.

___ This firm will award no subcontracts (including in the procurement of equipment, supplies, or services), in the performance of this contract.

___ This firm advertised for DBE subcontractors according to the good faith efforts outlined in the IEPA DBE Guidance Document.

___ This firm received proposals from DBE(s) that will not be utilized. A list of the DBEs not hired, along with their address, phone number, and reason(s) for non-utilization, is below.

___ This firm did not receive any inquiries from DBEs.

I certify that the above is true. I further certify that this firm and its partners, directors, and officers do not possess a controlling interest in ownership or conflict of interest or any other authority to control the DBE to be used during the performance of the contracts.

By:_____

NAME:_____

TITLE: _____

Company: _____

Date: ___/ _____

EPA Disadvantaged Business Enterprise (DBE) Program Form #3
Subcontractor Utilization Form

(Only complete this form if DBE subcontractors or sub-consultants will be working on a project)

This form is intended to capture the DBE subcontractor's description of work to be performed and the price of the work submitted to the prime contractor. All subcontractors must complete this form, and it must be included in the prime contractor's bid package.

Subcontractor Name	Project Name
Contact Person's Name & Title	
Address	
Telephone	Email
DBE Certified By:	Select all that apply. At least one is required: MBE WBE SBE DBE
Prime Contractor Name	

Type of Work to be Performed	Cost Estimate of Work

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to using the subcontractors above. I am aware that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 C.F.R. Part 33 Section 33.302(c).

Prime Contractor Signature:	Print Name:
Date:	Title:
Subcontractor Signature:	Print Name:
Date:	Title:

IEPA Disadvantaged Business Enterprise (DBE) Program Form #4, Bidders List

(Only complete this form if subcontractors or sub-consultants will be working on a project) Using this form/format is optional. Other formats are acceptable.

Company Name & **Contact Person**	Address	Phone No. w/ area code	Email	Proposed Work (supplies, paint, paint etc.)	DBE Status (MBE, WBE, DBE, SBE or Not Applicable)
					Check if Hired ☐
					Check if Hired ☐
					Check if Hired ☐
					Check if Hired ☐

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Bidder Certification for Advertisement Regarding Subcontracting Opportunities for Disadvantaged Businesses

I,_____, do hereby certify
(Name)
that:

1. I am_____of the_____and have authority
to Name Firm
execute this certification on behalf of the firm;

2. This firm did not receive any proposals from disadvantaged businesses, prior to bid opening
_____.
Date of Bid Opening

Name of Firm_____

Signature_____

Title _____

Date _____

Corporate Seal (where appropriate)

Bidder Certification Regarding the Use of
Iron, Steel, Manufactured Products, and Construction Materials produced in the United States
(Build America, Buy America Act)

I_____, do hereby certify that:

Name

1. I am_____(title) of the_____(company, partnership, etc.) and have authority to execute this certification on behalf of the firm.

2. I am aware that all iron, steel, manufactured products, and construction materials used for this project must be produced in the United States per the federal Build America, Buy America Act (BABA) signed by President Biden on November 15, 2021. Pub. L No. 117-58, §§ 70901-52.

3. I understand the term "iron and steel products" refers to the following products made primarily of iron or steel: lined or unlined pipes and fittings manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

4. I understand that all manufactured products used in the project must be produced in the United States. This means the manufactured product was manufactured in the United States, and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product.

5. I acknowledge that all construction materials for this project must be manufactured in the United States. This means all manufacturing processes for the construction materials occurred in the United States.

6. I am aware that this requirement applies to all portions of the project that are subcontracted.

Signature _____

Date _____

Corporate Seal (where appropriate)

Requirements Specific to Buy America, Build America Act (BABA)

On November 15, 2021, President Biden signed into law the Infrastructure Investment and Jobs Act ("IIJA"), Pub. L. No. 117-58, which includes the Build America, Buy America Act ("BABA"). The purpose of BABA is to ensure that federally funded infrastructure projects only utilize iron, steel, manufactured products, and construction materials produced in the United States. The requirement to use products produced in the United States applies to all projects for the construction, alteration, maintenance, or repair of publicly owned treatment works (POTW) or public water systems. Since Illinois' Clean Water State Revolving Fund (CWSRF) and Drinking Water State Revolving Fund (DWSRF) utilize federal funds, loan recipients must use iron, steel, manufactured products, and construction materials that are produced in the United States. Guidance is available on USEPA's website: https://www.epa.gov/cwsrf/build-america-buy-america-baba. Waivers from the requirements are available under certain circumstances. BABA requires the following:

1. All iron and steel used in the project are produced in the United States. This means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

2. All manufactured products used in the project are produced in the United States. This means the manufactured product was manufactured in the United States, and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation.

3. All construction materials are manufactured in the United States. This means that all manufacturing processes for the construction material occurred in the United States.

BABA only applies to items that are consumed in, incorporated into, or affixed to an infrastructure project. It does not apply to tools, equipment, and supplies, such as temporary scaffolding, brought to the construction site and removed at project completion. BABA does not apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished infrastructure project but are not an integral part of or permanently affixed to the structure. BABA requirements apply to an entire infrastructure project, even if it is funded by both Federal and non-Federal funds under one or more awards.

Construction Materials includes an article, material, or supply that consists primarily of:

- non-ferrous metals;
- plastic and polymer-based products including polyvinylchloride, composite building materials, and polymers used in fiber optic cables;
- glass including optic glass;
- lumber; or
- drywall.

Construction Materials does NOT include items made primarily of iron or steel; manufactured products; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives.

Requirements Specific to Iron and Steel

The existing American Iron and Steel (AIS) Requirements will continue as part of BABA. An iron or steel product is one of the items listed below and is made primarily of iron or steel that is permanently incorporated into the public water system or treatment works.

- Pipes (lined or unlined) and pipe fittings
- Pipe clamps and restraints
- Valves
- Structural steel
- Hydrants
- Flanges
- Tanks
- Reinforced precast concrete
- Manhole Covers and other municipal castings such as valves boxes, drainage grates, bollards, etc.
- Construction materials such as trusses, wire, grating, wire, ductwork, fence tubing, wall panels, etc.

For one of the listed iron or steel products to be considered subject to the BABA requirements, it must be made of greater that 50% iron or steel, measured by the material costs. "Steel" means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel and other specialty steels. AIS Guidance is available at: https://epa.illinois.gov/topics/grants-loans/state-revolving-fund/guidance/american-iron-and-steel-requirements.html.

Recordkeeping and Documenting the Country of Origin for Iron, Steel, Manufactured Products, & Construction Materials used in Loan Funded Projects

Loan recipients with assistance from their general contractor must be able to verify that products used in their projects comply with the BABA requirements. USEPA recommends loan recipients use a "Step Certification" process to ensure that producers adhere to the BABA requirements. Step certification is a process under which each handler (supplier, fabricator, manufacturer, etc.) of the iron, steel, manufactured products, or construction materials certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin.

A certification can be quite simple if it includes the name of the manufacturer, the location of the manufacturing facility (not company headquarters), a description of the product or item being delivered, and a signature by a manufacturer's responsible party. Certification could be achieved by other methods such as requiring the final manufacturer, who delivers the products to the worksite, to provide certification that all manufacturing processes occurred in the US. While this type of certification is easier and acceptable, it may not provide the same degree of assurance and additional documentation

may be needed. USEPA auditors recommend keeping records of when and where the products were delivered. Records from the manufacturer should refer to specific items such as pipes, valves, meters. Try to avoid records containing broad statements such as, “All products delivered were USA made”.

Regardless of the method, documents regarding the country of origin for all covered items should be collected and maintained by the loan recipients. Having a good paper trail is invaluable during an inspection or audit.

Sample Certification Letter

Below is a sample step certification letter for BABA compliance. The completed letter is provided to the construction contractor or loan applicant by the supplier, fabricator, manufacturer, etc. of covered products. Documentation must be provided on company letterhead.

Company Letterhead

Date

Company Name
Company Address
City, State, Zip

Subject: Build America, Buy America Act Step Certification for Project (Identify Project Here xxx)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project are in full compliance with the federal Build America, Buy America Act requirements as required in EPA’s State Revolving Fund Programs.

Item, Products, and/or Materials:

1. XXX
2. XXX
3. XXX

Such process took place at the following location (City and State must be included):

If any of the above compliance statements change while providing material for this project, we will immediately notify the prime contractor and the engineer.

Signed by Company Representative

Name Clearly Typed

Employment of Illinois Workers on Public Works Act

This law comes into effect following two consecutive months of a state unemployment rate above 5 percent. More information about the Employment of Illinois Workers on Public Works Act can be found here: http://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=549&ChapterID=7.

The Employment of IL Workers on Public Works Act requires the workforce on all public works projects to be comprised of a minimum of 90% Illinois residents.

The Illinois Department of Labor (IDOL) administers the Employment of Illinois Workers on Public Works Act, which was enacted to alleviate unemployment in Illinois by ensuring that most workers on public works projects live in the state. The requirement applies to all labor on public works projects or improvements. That includes public works projects that are funded in whole or in part with state funds or funds administered by the state of Illinois. Any public works project financed in whole or in part by federal funds administered by the state of Illinois is covered under the provisions of this act.

By signing below, the Contractor confirms awareness of this requirement.

_____

(Typed Name & Title of Authorized Representative)

_____

(Signature of Authorized Representative) (Date)

_____

(Company/Organization)

Illinois Works Jobs Program Act – Apprenticeship Initiative
Information for Contractors

Summary: The Illinois Works Jobs Program Act, 30 ILCS 559/Art. 20, is a statewide initiative to ensure that all Illinois residents have access to State capital projects and careers in the construction industry and building trades and to provide contracting and employment opportunities to historically underrepresented populations in the construction industry. This will be accomplished through three programs created by the Illinois Works Jobs Program Act: the Illinois Works Apprenticeship Initiative, the Illinois Works Pre-Apprenticeship Program, and the Illinois Works Bid Credit Program. Additional information is available at the following website: https://www2.illinois.gov/dceo/WorkforceDevelopment/Pages/IllinoisWorksJobsProgramAct.aspx.

The goal of the Illinois Works Apprenticeship Initiative ("10% apprenticeship goal") is that for projects estimated to cost $500,000 or more, apprentices will perform either 10% of the total labor hours actually worked in each prevailing wage classification or 10% of the estimated labor hours in each prevailing wage classification, whichever is less. The 10% apprenticeship goal applies to projects being paid for in whole or in part by appropriated capital funds to construct a public work either through a contract or grant issued by a State agency. A determination was made that this requirement also applies to IEPA loans. The $500,000 threshold applies to the total project cost and NOT the total cost or value of an individual construction contract.

Certification: Apprentices are required to be U.S. Dept. of Labor certified (not limited to pre-apprentice program graduates).

Applicability

If a project is estimated to received $500,000 or more of State Capital Funding for the Project:

If the state's contribution to the project amount equals 50% or more of the cost for the project, the 10% apprenticeship requirement applies to all prevailing wage eligible work performed by contractors on the public works project.

If the state's contribution to the project is less than 50% of the cost for the project, the 10% apprenticeship requirement applies only to prevailing wage eligible work being funded from state funds.

The Project has less than $500,000 of State Capital Funding, but the Total Estimated Project Cost is $500,000 or more:

If the state's contribution to the project amount equals 50% or more of the estimated cost for the project, the 10% apprenticeship requirement applies to all prevailing wage eligible work performed by contractors on the public works project.

If the state's contribution to the project is less than 50% of the estimated cost for the project, the 10% apprenticeship requirement does not apply.

Total Estimated Project Cost is less than $500,000: The 10% apprenticeship requirement does not apply. The $500,000 threshold applies to the total project cost and NOT the total cost or value of an individual construction contract.

Waivers from the Requirements: If goals cannot be met, the state has discretion to grant waivers, reductions or to hold public hearings on the issue. Factors to be considered include the scale of the project and whether the contractor or subcontractor seeking the action has previously requested reductions or waivers. A waiver form is available on the IEPA website at: https://www2.illinois.gov/epa/Documents/epa-forms/water/financial-assistance/apprenticeship/Waiver-Request.pdf. The form can also be obtained from DCEO.

Reporting: An example quarterly reporting form is attached. A fillable version is available on the IEPA website. Contractors should coordinate with the loan applicant and their consultant for further instructions regarding these forms. Loan applicants are ultimately responsible for reporting quarterly labor hours to the state, but coordination with their contractor is essential. All loan funded projects are subject to payment of Davis Bacon wages.

For general apprenticeship questions, please contact the Illinois Works Office at: CEO.ILWorks@Illinois.gov.

ILLINOIS WORKS APPRENTICESHIP INITIATIVE
QUARTERLY PERIODIC GRANTEE REPORT

Loan Recipient Organization Name:		FEIN Number:		Unique Entity ID Number:	
Loan Awarding Agency:		Project Start Date:		Project End Date:	
Loan Number:		Estimated Total Project Costs:		Estimated Total State Contribution:	

REPORTING PERIOD:

Period Start Date: Period End Date:

APPLICABLE APPRENTICESHIP GOAL (SELECT ALL THAT APPLY):

☐ 10% Total Project Cost ☐ 10% Total State Contribution Only

☐ Waiver Approved by IL DCEO IL DCEO Waiver Approval Date:

(If a waiver was granted for any prevailing wage classification, the Grantee does not need to report on those classifications on this form.)

☐ Reduction Approved by IL DCEO IL DCEO Reduction Approval Date:

(If selected, enter the applicable prevailing wage classification(s) and approved reduced percentage(s).)

PREVAILING WAGE CLASSIFICATION	REDUCED PERCENTAGE

PREVAILING WAGE CLASSIFICATION	REDUCED PERCENTAGE

ILLINOIS WORKS APPRENTICESHIP INITIATIVE
QUARTERLY PERIODIC GRANTEE REPORT

Please provide information in this chart for the entire project if the apprenticeship goal applies to the entire project. Provide information for only thestate contribution if the apprenticeship goal applies only to state appropriated capital funds.

PREVAILING WAGE CLASSIFICATION	TOTAL HOURS FOR CLASSIFICATION IN REPORTING PERIOD	TOTAL APPRENTICESHIP HOURS FOR CLASSIFICATION IN REPORTING PERIOD	% OF APPRENTICESHIP HOURS	TOTAL HOURS FOR CLASSIFICATION YTD	TOTAL APPRENTICESHIP HOURS YTD	% OF APPRENTICESHIP HOURS YTD	IF NO APPRENTICESHIP HOURS RECORDED, EXPLAIN

ILLINOIS WORKS APPRENTICESHIP INITIATIVE
QUARTERLY PERIODIC REPORT

Loan Recipient Organization Certification and State Agency Acknowledgement

1. Loan Recipient Organization Certification

By signing this form, I certify to the best of my knowledge and belief that the form is true, complete and accurate and that any false, fictitious or fraudulent information or the omission of any material fact could result in the immediate termination of my loan(s).

Loan Recipient Organization Name

Printed Name (Executive Director or equivalent)

Title (Executive Director or equivalent)

Signature (Executive Director or equivalent)

Date/Time Field

2. State Agency Acknowledgement

State Agency

Printed Name

Title

Signature

Date/Time Field

Illinois Works Jobs Program Act Apprenticeship Initiative

Contractor Certification

I have reviewed the provided information regarding this initiative and agree to coordinate with the loan recipient or their consultant to comply with the requirements.

I have reviewed and agree to the terms provided in form EJCDC C-410 Bid Form. I understand that completion of this form is a requirement for Bid Submittal.

By signing below, the Contractor confirms awareness of these requirements.

_____

(Typed Name & Title of Authorized Representative)

_____

(Signature of Authorized Representative) (Date)

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

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To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC's Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition). The full EJCDC Construction series of documents is discussed in the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer

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has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. ("CERCLA"); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. ("RCRA"); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Engineer*—The individual or entity named as such in the Agreement.

21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.

23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

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24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.

26. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.

32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.

33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.

35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

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37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.

38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.

42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.

45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

46. *Unit Price Work*—Work to be paid for on the basis of unit prices.

47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

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48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*:

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day*:

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*:

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents; or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).

E. *Furnish, Install, Perform, Provide*:

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

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3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.

C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

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3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.

B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or

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computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

A. Standards Specifications, Codes, Laws and Regulations

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*:

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict,

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error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*:

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

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3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

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2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. abnormal weather conditions;

3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and

4. acts of war or terrorism.

D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.

E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

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G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*:

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part

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by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;

2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

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5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or

2. is of such a nature as to require a change in the Drawings or Specifications; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

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c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or

b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice as required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;

c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after

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becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

C. *Engineer's Review*: Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;

    b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

    c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and

    d. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

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5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

2. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

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F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.

H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.H shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

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ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.

B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.

D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.

E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is

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maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.

H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.

I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.

J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

A. *Workers' Compensation*: Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.

2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).

3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

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4. Foreign voluntary worker compensation (if applicable).

B. *Commercial General Liability—Claims Covered*: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:

1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.

2. claims for damages insured by reasonably available personal injury liability coverage.

3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

C. *Commercial General Liability—Form and Content*: Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage:

a. Such insurance shall be maintained for three years after final payment.

b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.

2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.

3. Broad form property damage coverage.

4. Severability of interest.

5. Underground, explosion, and collapse coverage.

6. Personal injury coverage.

7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.

8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.

E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.

F. *Contractor's pollution liability insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result

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of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.

H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:

1. include at least the specific coverages provided in this Article.

2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.

3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.

4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.

5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.

J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

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6.04 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."

2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.

3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

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5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).

6. extend to cover damage or loss to insured property while in transit.

7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

8. allow for the waiver of the insurer's subrogation rights, as set forth below.

9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.

10. not include a co-insurance clause.

11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.

12. include performance/hot testing and start-up.

13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.

B. *Notice of Cancellation or Change*: All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.

C. *Deductibles*: The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

E. *Additional Insurance*: If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.

F. *Insurance of Other Property*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

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6.06 *Waiver of Rights*

A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.

D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the

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policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and

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guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 *"Or Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

3) it has a proven record of performance and availability of responsive service; and

4) it is not objectionable to Owner.

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

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D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

a. shall certify that the proposed substitute item will:

1) perform adequately the functions and achieve the results called for by the general design,

2) be similar in substance to that specified, and

3) be suited to the same use as that specified.

b. will state:

1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,

2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

c. will identify:

1) all variations of the proposed substitute item from that specified, and

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2) available engineering, sales, maintenance, repair, and replacement services.

d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.

B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

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E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.

J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.

K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.

L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.

N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

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O. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

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7.09 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.12 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;

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2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or

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exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements*:

1. Before submitting a Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings*:

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to

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provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples*:

   a. Contractor shall submit the number of Samples required in the Specifications.

   b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Other Submittals*: Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.

D. *Engineer's Review*:

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.

5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

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8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures*:

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal;

6. the issuance of a notice of acceptability by Engineer;

7. any inspection, test, or approval by others; or

8. any correction of defective Work by Owner.

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D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.

B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop

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Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

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8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. an itemization of the specific matters to be covered by such authority and responsibility; and

3. the extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.

C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

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D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

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9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during

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or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.

B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.

C. Engineer's authority as to Change Orders is set forth in Article 11.

D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

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B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

1. *Change Orders*:

a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.

b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.

2. *Work Change Directives*: A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an

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adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on

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the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.01.C.2.a and 11.01.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.

B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

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the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures*: Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.

2. *Engineer's Action*: Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

3. *Binding Decision*: Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

B. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and

4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

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B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*:

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim

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submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable

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thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

    c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

    d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

    e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

    f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes

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other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*: When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

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B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.

E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

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ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

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cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

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B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will

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include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments*:

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*:

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

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a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

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e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*:

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*:

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. the Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. the Contract Price has been reduced by Change Orders;

i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;

j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

l. there are other items entitling Owner to a set off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount

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remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

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E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.

2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*:

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

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inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents;

   b. consent of the surety, if any, to final payment;

   c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

   d. a list of all disputes that Contractor believes are unsettled; and

   e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Application and Acceptance*:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due*: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation,

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including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such other adjacent areas;

2. correct such defective Work;

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

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E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses,

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and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

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expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this Article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and

2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this Article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

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18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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SUPPLEMENTARY CONDITIONS

Prepared by



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Supplementary Conditions

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC® C-700 (2013 Edition). All provisions that are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

ARTICLE 2 – PRELIMINARY MATTERS

SC-2.02.A. Copies of Documents

SC-2.02.A. Amend the first sentence of Paragraph 2.02.A. to read as follows:

Owner shall furnish to Contractor three (3) copies of the Contract Documents (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF).

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.03 Subsurface and Physical Conditions

SC-5.03 Add the following new paragraphs immediately after Paragraph 5.03.B:

C. The following reports of explorations and tests of subsurface conditions at or adjacent to the Site are known to Owner:

1. Report dated March 01, 2022, prepared by Holcomb Foundation Engineering, Carbondale, IL, entitled: "SUBSURFACE EXPLORATION AND FOUNDATION RECOMMENDATIONS PROPOSED WATER TREATMENT FACILITY, ROBINSON, IL", consisting of Sixty (60) pages. The Technical Data contained in such report upon whose accuracy Contractor may rely on are the Appendix and Boring Logs.

SC 5.06 Hazardous Environmental Conditions

SC-5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

B. Not Used.

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ARTICLE 6 – BONDS AND INSURANCE

SC 6.03 Contractors Liability Insurance

SC-6.03 Add the following new paragraph immediately after Paragraph 6.03.J:

K. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under Paragraphs 6.03.A.1 and A.2 of the General Conditions:

State:	Statutory
Federal, if applicable (e.g., Longshoreman's):	Statutory
Employer's Liability:	
Bodily injury, each accident	$ 1,000,000
Bodily injury by disease, each employee	$ 1,000,000
Bodily injury/disease aggregate	$ 1,000,000
Foreign voluntary worker compensation	Statutory

2. Contractor's Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:

General Aggregate	$ 2,000,000
Products - Completed Operations Aggregate	$ 2,000,000
Personal and Advertising Injury	$ 1,000,000
Each Occurrence (Bodily Injury and Property Damage)	$ 1,000,000

3. Automobile Liability under Paragraph 6.03.D. of the General Conditions:

Bodily Injury:	
Each person	$ 1,000,000
Each accident	$ 1,000,000
Property Damage:	
Each accident	$ 1,000,000

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4. Excess or Umbrella Liability:

Per Occurrence	$	2,000,000
General Aggregate	$	2,000,000

5. Contractor's Pollution Liability:

Each Occurrence	$	N.A.
General Aggregate	$	N.A.

☒ If box is checked, Contractor is not required to provide Contractor's Pollution Liability insurance under this Contract

6. Additional Insureds: In addition to Owner and Engineer, include as additional insureds the following:
   a. Robinson-Palestine Water Commission, Robinson, IL
   b. Farnsworth Group, Inc.
7. Contractor's Professional Liability:

Each Claim	$	N.A.
Annual Aggregate	$	N.A.

SC-6.05 Property Insurance

SC-6.05.A.1. Add the following new subparagraph after subparagraph 6.05.A.1:

a. In addition to Owner, Contractor, and all Subcontractors, include as insureds the following:
   i. Farnsworth Group, Inc.

SC-6.05.A. Add the following to the list of items in Paragraph 6.05.A, as numbered items:

14. include for the benefit of Owner loss of profits and soft cost coverage including, without limitation, fixed expenses and debt service for a minimum of 12 months with a maximum deductible of 30 days, plus attorneys fees and engineering or other consultants' fees, if not otherwise covered;

16. include, in addition to the Contract Price amount, the value of the following equipment and materials to be installed by the Contractor but furnished by the Owner or third parties:

a. *None*

17. include by express endorsement coverage of damage to Contractor's equipment.

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ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

*SC-**7.02 Labor; Working Hours***

SC-7.02.C. Add the following new paragraph immediately after Paragraph 7.02.B:

Owner shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer's services (including those of the Resident Project Representative, if any), Owner's representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day. If Contractor is responsible but does not pay, or if the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

SC 7.06 Concerning Subcontractors, Suppliers, and other Others

SC-7.06 Add the following new paragraph immediately after Paragraph 6.06B:

The Bidder shall provide a list of Subcontractors, Suppliers, individuals or entities for the various subcontract portions of work and major equipment items as specified:

Subcontract or Equipment Specification Section	**General Description**	**Subcontractor, Supplier, individual, or entities**
Site Civil Subcontract	General site work, excavation, earthwork, seeding, etc.	
Building Subcontract	Building construction	
	Roofing construction	
Concrete Subcontract	cast-in-place concrete construction including foundations, access roads and driveways, etc.	
Mechanical Subcontract	piping inside and outside buildings and structures, underground and exposed piping, plumbing equipment, accessories, process piping, piping insulation, etc.	
HVAC Subcontract	heating and ventilating system, air conditioning, temperature control system for WTP building	
Electrical Subcontract	electric power distribution, lighting, control wiring and conduits	
Painting Subcontract	Building and Equipment to be painted on site	

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Instrumentation & Controls Subcontract	Panel Fabricator (MCP and LCPs)	
	Radio System Supplier	
	Network Consultant	

SC 7.09 Taxes

SC-7.09 Add a new paragraph immediately after Paragraph 7.09.A:

B. Owner is exempt from payment of sales and compensating use taxes of the State of Illinois and of cities and counties thereof on all materials to be incorporated into the Work.

1. Owner will furnish the required certificates of tax exemption to Contractor for use in the purchase of supplies and materials to be incorporated into the Work.

2. Owner's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated into the Work.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

*SC-**10.03 Project Representative***

SC-10.03. Add the following new paragraphs immediately after Paragraph 10.03.A:

B. The Resident Project Representative (RPR) will be Engineer's representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions.

1. General: RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall generally communicate with Owner only with the knowledge of and under the direction of Engineer.

2. Schedules: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.

3. Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.

4. Liaison:

a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.

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b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.

c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.

5. Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.

6. Shop Drawings and Samples:

   a. Record date of receipt of Samples and Contractor-approved Shop Drawings.

   b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.

   c. Advise Engineer and Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by Engineer.

7. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.

8. Review of Work and Rejection of Defective Work:

   a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.

   b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

9. Inspections, Tests, and System Start-ups:

   a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.

   b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.

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10. Records:

    a. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.

    b. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.

    c. Maintain records for use in preparing Project documentation.

11. Reports:

    a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.

    b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.

    c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.

12. Payment Requests: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

13. Certificates, Operation and Maintenance Manuals: During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.

14. Completion:

    a. Participate in Engineer's visits to the Site to determine Substantial Completion, assist in the determination of Substantial Completion and the preparation of a punch list of items to be completed or corrected.

    b. Participate in Engineer's final visit to the Site to determine completion of the Work, in the company of Owner and Contractor, and prepare a final punch list of items to be completed and deficiencies to be remedied.

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c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the notice of acceptability of the work.

C. The RPR shall not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).

2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.

3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work.

5. Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.

6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.

7. Accept Shop Drawing or Sample submittals from anyone other than Contractor.

8. Authorize Owner to occupy the Project in whole or in part.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

*SC-**15.03** **Substantial Completion***

SC 15.03.B Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, shall be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

SC-17.02 Add the following new paragraph immediately after Paragraph 17.01.

SC-17.02 Arbitration

A. All matters subject to final resolution under this Article will be decided by arbitration in accordance with the rules of mutually agreed upon entity, subject to the conditions and limitations of this paragraph. This agreement to arbitrate and any other agreement or consent to arbitrate entered into will be specifically enforceable under the prevailing law of any court having jurisdiction.

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B. The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitrator or arbitration provider, and a copy will be sent to Engineer for information. The demand for arbitration will be made within the specific time required in this Article, or if no specified time is applicable within a reasonable time after the matter in question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such matter in question would be barred by the applicable statute of limitations. The demand for arbitration should include specific reference to Paragraph SC-17.02.D below.

C. No arbitration arising out of or relating to the Contract shall include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:

1. the inclusion of such other individual or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration; and

2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings.

D. The award rendered by the arbitrator(s) shall be consistent with the agreement of the parties, in writing, and include a concise breakdown of the award, and a written explanation of the award specifically citing the Contract provisions deemed applicable and relied on in making the award.

E. The award will be final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal, subject to provisions of the Laws and Regulations relating to vacating or modifying an arbitral award.

F. The fees and expenses of the arbitrators and any arbitration service shall be shared equally by Owner and Contractor.

ARTICLE 18 – MISCELLANEOUS

SC-18.09 Add the following new paragraph immediately after Paragraph 18.08.

18.09 Certified Payroll Requirements (Public Act 94-0515)

1. Contractor and subcontractors on public works projects must submit certified payroll records on a weekly basis to the public body in charge of the construction project, along with a statement affirming that such records are true and accurate, that the wages paid to each worker are not less than the required rate and that the contractor is aware that filing records he or she knows to be false is a Class B misdemeanor.

2. The certified payroll records must include for every worker employed on the public works project the name, address, telephone number, social security number, job classification, hourly wages paid in each pay period, number of hours worked each day, and starting and ending time of work each day. These certified payroll records

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are considered public records and public bodies must make these records available to the public under the Freedom of Information Act, with the exception of the employee's address, telephone number and social security number.

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EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Work Change Directive No.

Date of Issuance:		Effective Date:	
Owner:	Robinson-Palestine Water Commission	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	Farnsworth Group, Inc.	Engineer's Project No.:	0210007.00
Project:	Water Treatment Plant and Campus	Contract Name:	

Contractor is directed to proceed promptly with the following change(s):

Description:

Attachments: *[List documents supporting change]*

Purpose for Work Change Directive:

Directive to proceed promptly with the Work described herein, prior to agreeing to changes on Contract Price and Contract Time, is issued due to: *[check one or both of the following]*

☐ Non-agreement on pricing of proposed change.

☐ Necessity to proceed for schedule or other Project reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price $ [increase] [decrease].

Contract Time days [increase] [decrease].

Basis of estimated change in Contract Price:

☐ Lump Sum ☐ Unit Price

☐ Cost of the Work ☐ Other

RECOMMENDED:	AUTHORIZED BY:	RECEIVED:
By:	By:	By:
Engineer (Authorized Signature)	Owner (Authorized Signature)	Contractor (Authorized Signature)
Title:	Title:	Title:
Date:	Date:	Date:

Approved by Funding Agency (if applicable)

By: Date:

Title:

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Change Order No. _____

Date of Issuance:		Effective Date:	
Owner:	Robinson-Palestine Water Commission	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	Farnsworth Group, Inc.	Engineer's Project No.:	0210007.00
Project:	Water Treatment Plant and Campus	Contract Name:	

The Contract is modified as follows upon execution of this Change Order:

Description:

Attachments: *[List documents supporting change]*

CHANGE IN CONTRACT PRICE	**CHANGE IN CONTRACT TIMES** *[note changes in Milestones if applicable]*
Original Contract Price: $_____	Original Contract Times: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: $_____	[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: Substantial Completion: _____ Ready for Final Payment: _____ days
Contract Price prior to this Change Order: $_____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] of this Change Order: $_____	[Increase] [Decrease] of this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
Contract Price incorporating this Change Order: $_____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for Final Payment: _____ days or dates

RECOMMENDED:	ACCEPTED:	ACCEPTED:
By: _____	By: _____	By: _____
Engineer (if required)	Owner (Authorized Signature)	Contractor (Authorized Signature)
Title: _____	Title _____	Title _____
Date: _____	Date _____	Date _____

Approved by Funding Agency (if applicable)

By: _____ Date:

Title: _____

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Field Order No. _____

Date of Issuance:		Effective Date:	
Owner:	Robinson-Palestine Water Commission	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	Farnsworth Group, Inc.	Engineer's Project No.:	0210007.00
Project:	Water Treatment Plant and Campus	Contract Name:	

Contractor is hereby directed to promptly execute this Field Order, issued in accordance with General Conditions Paragraph 11.01, for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, submit a Change Proposal before proceeding with this Work.

Reference: _____ Specification(s) _____ Drawing(s) / Detail(s)

Description:

Attachments:

ISSUED:	RECEIVED:
By: _____ Engineer (Authorized Signature)	By: _____ Contractor (Authorized Signature)
Title: _____	Title: _____
Date: _____	Date: _____

Copy to: Owner

"General Decision Number: IL20250015 10/03/2025

Superseded General Decision Number: IL20240015

State: Illinois

Construction Types: Heavy and Highway

Counties: Adams, Brown, Cass, Champaign, Christian, Clark, Coles, Cumberland, De Witt, Douglas, Edgar, Logan, Macon, Mason, Menard, Morgan, Moultrie, Piatt, Pike, Sangamon, Schuyler, Scott, Shelby and Vermilion Counties in Illinois.

DE WITT COUNTY:

HEAVY CONSTRUCTION PROJECTS (including Sewer & Water Line Construction & Drainage Projects) & HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects, and railroad construction; bascule, suspension & spandrel arch bridges; bridges designed for commercial navigation; bridges involving marine construction, other major bridges).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a

conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2025
1	01/10/2025
2	02/21/2025
3	07/11/2025
4	07/18/2025
5	08/29/2025
6	09/26/2025
7	10/03/2025

BRIL0008-011 05/01/2020

LOGAN, MORGAN and SCOTT COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 31.91	21.93

CARP0237-012 05/15/2020

MASON COUNTY

	Rates	Fringes
CARPENTER	$ 33.55	30.07
PILEDRIVERMAN	$ 33.55	30.07

CARP0237-021 05/01/2021

DE WITT COUNTY

	Rates	Fringes
CARPENTER	$ 37.06	31.16
PILEDRIVERMAN	$ 37.06	31.16

CARP0243-001 05/15/2020

CHAMPAIGN, EDGAR, AND VERMILION COUNTIES

	Rates	Fringes
CARPENTER	$ 37.85	25.77
PILEDRIVERMAN	$ 37.85	25.77

CARP0243-006 05/15/2020

COLES, CUMBERLAND, MOULTRIE, and SHELBY COUNTIES

	Rates	Fringes
CARPENTER	$ 35.65	27.97
PILEDRIVERMAN	$ 35.65	27.97

CARP0243-009 05/15/2020

DOUGLAS COUNTY

	Rates	Fringes
CARPENTER	$ 35.65	27.97
PILEDRIVERMAN	$ 35.65	27.97

CARP0243-014 05/01/2017

CLARK COUNTY

	Rates	Fringes
CARPENTER	$ 36.20	21.92
PILEDRIVERMAN	$ 37.20	21.92

CARP0270-004 05/01/2017

CHRISTIAN, MENARD, AND SANGAMON (Except Illiopolis) COUNTIES

	Rates	Fringes
CARPENTER	$ 32.15	25.97
PILEDRIVERMAN	$ 33.15	25.97

CARP0270-007 05/01/2017

ADAMS COUNTY

	Rates	Fringes
CARPENTER	$ 31.55	25.97
PILEDRIVERMAN	$ 32.55	25.97

CARP0270-016 05/15/2020

MACON, MOULTRIE (North of Rt #133), PIATT (Southwestern Half), SANGAMON (Illiopolis) AND SHELBY (Moweaqua & North thereof) COUNTIES

	Rates	Fringes
CARPENTER	$ 35.05	28.57
PILEDRIVERMAN	$ 35.05	28.57

CARP0270-021 05/15/2020

LOGAN COUNTY

	Rates	Fringes
CARPENTER	$ 35.05	28.57
PILEDRIVERMAN	$ 35.05	28.57

CARP0270-024 05/15/2020

BROWN, CASS, MORGAN, PIKE, AND SCOTT COUNTIES

	Rates	Fringes
CARPENTER	$ 35.05	28.57
PILEDRIVERMAN	$ 35.05	28.57

CARP0270-026 05/01/2017

SCHUYLER COUNTY

	Rates	Fringes
CARPENTER	$ 32.15	25.97

ELEC0034-012 03/01/2019

MASON (Except Bath, Crane Creek, Kilbourne, Lynchburg, Mason City, & Salt Creek TWPS) COUNTY

	Rates	Fringes
ELECTRICIAN	$ 37.51	21.67

ELEC0034-015 03/01/2023

ADAMS COUNTY

	Rates	Fringes
ELECTRICIAN	$ 35.00	20.67

ELEC0051-003 01/01/2024

ADAMS, BROWN, CASS, CHAMPAIGN, CHRISTIAN, DEWITT, DOUGLAS, EDGAR, LOGAN, MACON, MASON, MENARD, PIATT, SCHUYLER, SCOTT, VERMILION, COLES (East Oakland, Humboldt, Morgan, North Okaw, and Seven Hickory TWPS), MORGAN, MOULTRIE (Except Whitley TWP), PIKE, SANGAMON, & SHELBY (that portion West of Holland, Prairie, Richland, and Windsor TWPS) COUNTIES

	Rates	Fringes
Line Construction		
Groundman/Equipment Operator (All crawler type equipment larger than D-4, 15 ton crane or larger)	$ 52.63	32.5%+7.25
Groundman/Truck Driver	$ 39.92	32.5%+7.25
Lineman and Substation Technician	$ 58.58	32.5%+7.25

ELEC0146-003 06/01/2022

CHRISTIAN, COLES, CUMBERLAND, DE WITT (Harp, Wapella, Barnett, Clintonia, De Witt, Turnbridge, Texas, Creek & Nixon TWPS), DOUGLAS (Arcola, Burbon, Garrett TWPS & the portion of Tuscola lying West of the City of Tuscola & Illinois Central Railroad tracks), MACON, MOULTRIE, PIATT (Goose Creek, Willow Branch, Cerro Gordo, Bement & Unity TWPS), AND SHELBY COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 41.00	20.68

ELEC0193-004 06/03/2024

	Rates	Fringes
ELECTRICIAN		
CASS, LOGAN, MASON (Bath, Crane Creek, Kilbourne,		

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     Lynchburg, Mason City &
     Salt Creek TWPS), MENARD,
     MORGAN, SANGAMON and SCOTT
     COUNTIES...................$ 39.80         5%+21.09
------------------------------------------------------------------
 ELEC0193-010 01/01/2025

CASS, LOGAN, MASON (Townships of Lynchburg, Bath, Kilbourne,
Crane Creek, Salt Creek, and Mason), MENARD, MORGAN, SCOTT, AND
SANGAMON COUNTIES


                                   Rates          Fringes

Line Construction
     Groundman - Equipment
     Operator (Class I, all
     crawler type equipment
     larger than D-4, 15 ton
     crane or larger)............$ 56.61       29.5%+7.50
     Groundman - Truck Driver
     (with winch, may operate
     diggers, 5th wheel type
     trucks, crawler-type
     equipment, D-4 and
     smaller, backhoe 3/4 yard
     and under, rubber tire and
     crawler w/end loader, and
     may drive bucket truck and
     live boom type line trucks).$ 42.85       29.5%+7.50
     Groundman - Truck Driver
     (without winch).............$ 40.36       29.5%+7.50
     Groundman (Class A).........$ 38.38       29.5%+7.50
     Lineman & Substation Tech...$ 62.90       29.5%+7.50
------------------------------------------------------------------
 ELEC0197-003 12/01/2021

                                   Rates          Fringes

Electricians:.....................$ 41.25            21.30
------------------------------------------------------------------
* ELEC0538-008 06/01/2025

VERMILION COUNTY

                                   Rates          Fringes

ELECTRICIAN.......................$ 41.00            27.36
------------------------------------------------------------------
 ELEC0702-002 01/06/2025

ALEXANDER, CLAY, CRAWFORD, EDWARDS, EFFINGHAM, FRANKLIN,
FAYETTE (Excludes portion North Avena), GALLATIN, HAMILTON,
HARDIN, JACKSON, JASPER, JEFFERSON, JOHNSON, LAWRENCE, MARION,
MASSAC, PERRY, POPE, PULASKI, RANDOLPH (Except Red Bud Twps),
RICHLAND, SALINE, UNION, WABASH, WAYNE, WHITE, AND WILLIAMSON
COUNTIES;
CLARK, COLES (Southern Half),  CUMBERLAND, MOULTRIE (Whitley
TWP), and SHELBY (Except West of Holland, Prairie, Richland, &
Windsor TWPS) COUNTIES;
BOND (Eastern Half), and WASHINGTON (OKAWVILLE & VENDY TWPS)
COUNTIES


                                   Rates          Fringes
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Line Construction

Groundman - Class A	$ 38.18	29%+8.85
Groundman - Equipment Operator Class II (all other equipment)	$ 46.49	29%+8.85
Heavy - Equipment Operator Class I (all crawler type equipment D-4 and larger)	$ 52.13	29%+8.85
Lineman	$ 65.52	29%+8.85

ENGI0649-006 04/01/2025

MASON COUNTY

	Rates	Fringes
OPERATOR: Power Equipment		
Group 1	$ 47.79	43.42+A
Group 2	$ 44.09	43.42+A
Group 3	$ 38.03	43.42+A

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Cranes: Overhead Cranes; Hydro Crane; Shovels; Crane type Backfiller; Tower Cranes-Mobile, Crawler, Stationary; Derricks, Hoist (3 drum); Draglines; Drott Yumbo & similar types considered as Cranes; 360 Degrees Swing Excavator, Backhoe; Derrick Boats; Pile Driver and Skid Rigs; Clam Shell; Locomotive Cranes; Road Pavers (Single Drum, Dual Drum, Tri Batcher); Motor Patrol & Power Blades (Dunmore, Elevating & similar types); Mechanics; Central Concrete Mixing Plant Operator; Asphalt Batch Plant Operator and Plant Engineer; Gradall; Caisson Rigs; Skimmer Scoop, Koehring Scooper; Dredges (all types); Hoptoe; All Cherry Pickers; Work Boat; Ross Carrier; Helicopter; Dozer; Tournadozer; Tournapulls (all & similar types); Concrete and all recycle machines, Multiple Unit Earth Movers; 75 cents per hour for each scoop over one; Scoops (all sizes); Pushcats; Endloaders (all types); Asphalt Surfacing Machine; Slip Form Paver; Rock Crusher; Material Crusher (outside pits and quarries); Screening Plants (outside pits and quarries); Tunnel Boring Machine; Heavy Equipment Greaser (Top Greaser on Spread); CMI, Auto Grade, CMI Belt Placer (3 track & similar types); Side Booms; Starting Engineer on Pipeline or Construction (eleven 11 pieces or more); Asphalt Heater & Planer Combination; Wheel Tractors with Dozer, Hoe or End Loader attachements; CAT Earthwork Compactors and similar types; Blaw Knox Spreader & similar types; Trench Machines; Pump Crete, Belt Crete, Squeeze Crete, Screw Type Pumps & Gypsum; Creter Crane; Concrete Pump Truck; Formless Finishing Machines; Flaherty Spreader or similar types; Screedman on Laydown Machine; Vermeer Concrete Saw; Laser Screed; Span Saw; Dredge Leverman; Dredge Engineer; Lull or similar type; Hydro-Boom Truck; Guard Rail Machine.

GROUP 2: Bulker & Pump; Power Launches; Boring Machine & Pipe Jacking Machine; Dinkeys; Carts, powered haul unit for a boring machine; P-H one Pass Soil Cement Machines and similar types: Wheel Tractor; Back Fillers; Euclid Loader; Fork LIfts; Jeep with Ditching Machines or other attachments; Tuneluger; Automatic Cement & Gravel Batching Plants; Mobile Drills Soil Testing and similar types); Pugmill with Pump; All 1 and 2 Drum Hoists; De-watering

Systems; Straw Blower; Hydro Seeder; Bump Grinders, Self Propelled; Assistant Heavy Equipment Greaser; Apsco Spreader Tractors (Track-Type w/o Power Units pulling Rollers); Rollers on Asphalt, Brick, or Macadam; Concrete Breakers; Concrete Spreaders; Cement Strippers; Cement Finishing Machines & CMI Texture & Reel Curing Machines; Vibro-Tampers & similar types self-propelled; Mechanical Bull-Floats; Self-Propelled Concrete Saw; Truck Mounted Power Saws; Curb Cutters; Mixers over 3 bags to 27E; Winch & Boom Trucks; Tractor pulling Power Blade or Elevating Grader; Porter Rex Rail; Clary Screed; Mule pulling Rollers; Pugmill w/o Pump; Barber Greene or similar Loaders; Track Type Tractor with power unit attached; Fireman; Spray Machine on paving; Curb Machine; Paved Ditch Machine; Power Broom; Self-Propelled Sweepers; Self-Propelled Conveyors; Power Subgrader; Oil Distributor; Straight Tractor; Truck Crane Oiler; Truck Type Oilers; Directional Boring Machine; Horizontal Directional Drill; Articulating End Dump Vehicles; Starting Engineer (6 to 10 pieces).

GROUP 3: Straight Framed Truck and Truck Mounted Vac Unit, Starting Engineer (3 to 5 pieces); Trac Air Machine w/o attachments; Rollers, 5 tons & under on earth & gravel; Form Grader; Bulk Cement Plant; Oilers.

- Escalated Rate on Crane, Derrick Booms, and Tower Cranes: Additional $1.00 per hour over scale when Crane or Derrick is positioned 50 ft. or more above adjacent ground level or water level. $.05 per hour, per foot, over 90 feet including jib. $0.02 per hour, per ton - over 50-ton capacity.

- Operating engineers who operate Lattice Boom Crawler Cranes, Lattice Boom Truck Cranes, Telescopic Boom Cranes less than 17.5 Tons, Tower Cranes, Overhead Cranes and have been Certified by hte National Commission for the Certification of Crane Operators on the equipment they operate shall receive $1.60 per hour over scale.

A. On designated Hazardous Waste jobs, operators shall receive:
Level A add $4.00 to the appropriate group rate; Levels B and C add $3.00 to the appropriate group rate; and Level D add $2.00 to the appropriate group rate.

ENGI0841-003 04/01/2023

CHAMPAIGN, CLARK, COLES, CUMBERLAND, DOUGLAS EDGAR, MOULTRIE, and VERMILION COUNTIES

	Rates	Fringes
OPERATOR: Power Equipment		
GROUP 1	$ 45.15	26.00
GROUP 2	$ 30.05	26.00

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Power Cranes, Draglines, Derricks, Shovels, Gradalls, Mechanics, Tractor Highlift, Tournadozer, Concrete Mixers with Skip, Tournamixer, Two-Drum Machine, One-Drum Hoist with Tower or Boom, Cableways, Tower

Machines, Motor Patrol, Boom Tractor, Boom or Winch Truck, Winch or Hydraulic Boom Truck, Truck Crane, Tournapull, Tractor Operating Scoops, Bulldozer, Push Tractor, Asphalt Planer, Finishing Machine on Asphalt, Large Rollers on Earth, Rollers on Asphalt Mix, Ross Carrier or Similar Machine, Gravel Processing Machine, Asphalt Plant Engineer, Paver Operator, Farm Tractor with Half Yard Bucket and/or Backhoe Attachments, Dredge Engineer, or Dredge Operator, Central Mix Plant Engineer, CMI or Similar Type Machine, Truck or Skid Mounted Concrete Pump, Tower Crane, Engine or Rock Crusher Plant, Concrete Plant Engineer, Ditching Machine with Dual Attachment, Tractor Mounted Loaders, Cherry Picker, Hydro Crane, Standard or Dinney Locomotives, Scoopmobiles, Euclid Loader, Soil Cement Machine, Back Filler, Elevating Machine, Power Blade, Drilling Machines Including Well Testing, Caissons, Shaft or Any Similar Type Drilling Machines, Motor Driven Paint Machine, Pipe Cleaning Machine, Pipe Wrapping Machine, Pipe Bending Machine, Apsco Paver, Boring Machine, (Head Equipment Greased), Barber- Greene Loaders, Formless Paver, (Well Point System), Concrete Spreader, Hydra Ax, Span Saw and Similar Types, Marine Scoops, Brush Mulcher, Brush Burner, Mesh Placer, Tree Mover, Helicopter Crew (3), Piledriver - Skid or Crawler, Stump Remover, Root Rake, Tug Boat Operator, Refrigerating Machine, Freezing Operator, Chair Cart-Self Propelled, Hydra Seeder, Straw Blower, Power Sub Grader, Bull Float, Finishing Machine, Self-Propelled Pavement Breaker (Backhoe Attached), Lull (or Similar Type Machine), Two Air Compressors, Compressors Hooked in Manifold, Overhead Crane, Chip Spreader, Mud Cat, Sull-Air Fork Lifts (Except When Used For Landscaping Work), Soil Stabilazer (Seaman Tiller, Bo Mag, Rago Gator and Similar Types or Equipment), Tube Float, Spray Machine, Curing Machine, Concrete or Asphalt Milling Machine, Snooper Truck Operator.

GROUP 2: Concrete Mixers Without Skips, Rock Crusher, Ditching Machine Under 6', Curbing Machine, one Drum Machines without Tower or Boom, Air Tugger, Self-Propelled Concrete Saw, Machine- Mounted Post Hole Digger, Two to Four Generators, Water Pumps, or Welding Machines, within 400ft., Air Compressor 600 cu. ft. and Under, Rollers on Aggregate and Seal Coat Surfaces, Fork Lifts (When Used For Landscaping Work, Concrete and Blacktop Curb Machine, Farm Tractor with less than Half Yard Bucket, One Water Pump, Oilers, Air Valves or Steam Valves, One Welding Machine, Truck Jack, Mud Jack, Gunnite Machine, House Elevators when used for Hoisting Material, Engine Tenders, Wagon Drill, Flex Plane, Conveyor, Siphons and Pulsometer, Switchman, Fireman on Paint Pots, Fireman on Asphalt Plants, Distributor Operators on Trucks, Tampers, Self-Propelled Power Broom, Striping Machine (Motor Driven), Form Tamper, Bulk Cement Plant Equipment Greaser, Deck Hands, Truck Crane Oiler_Driver, Cement Blimps, Form Grader, Temporary Heat, Throttle Valve, Farm Tractor, Super Sucker (and Similar Type of Equipment).

ENGI0965-002 05/01/2023

ADAMS, BROWN, CASS, CHRISTIAN, DE WITT, LOGAN, MACON, MENARD, MORGAN, PIATT, PIKE, SANGAMON, SCHUYLER, SCOTT, and SHELBY COUNTIES

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
Group 1	$ 47.21	30.20
Group 2	$ 41.88	30.20
Group 3	$ 33.67	30.20
Group 4	$ 48.81	30.20

PREMIUM PAY -

CRANES WITH BOOMS 120-200 ft. 1.00 per hour;

.02 Per Foot for each foot above 200

MULTIPLE UNIT MACHINE - 1.00 per hour;

UNDERGROUND WORK - 1.00 per hour;

UNDER AIR PRESSURE - 1.00 per hour;

HAZARDOUS WASTE OR ASBESTOS REMOVAL PROJECTS - 1.00 per hour for Level C work;

1.50 per hour for Level B work;

2.00 per hour for Level A work;

LONG BOOM ON A STATIONARY CRANE 1.00 per hour above long Boom Scale

Level A: (highest level of repiratory, skin, and eye protection)

Level B: (same as Level A, but a lower level of skin protection)

Level C: (same as Level B, but a lower level of respiratory protection)

OPERATING ENGINEER CLASSIFICATIONS:

GROUP 1: Asphalt Plant Engineer; Asphalt screed man; Apsco concrete spreader; Asphalt paver; Asphalt roller on bituminous contrete; Athey loaders; Cableways; Cherry Picker; Clam Shell; C.M.I. & Similar Type Autograde Formless Paver, Autgrade Placer & Finisher; Concrete Breaker; Concrete plant Oper; Concrete Pumps; Cranes; Derricks; Derrick boats; Draglines; Earth auger boring machine, Elevating Graders; Engineers on dredge; Gravel processing machines; Head equipment greaser; High lift or fork lift; Hoist with two drums or 2 or more loadlines; Locomotive; Mechanics; Motor graders or auto patrols; Operators or levelman on dredges; Power boat oper; Pug mill operator; (Asphalt plat); Orange peels; Overhead cranes; Paving mixer; Piledrivers; Pipe wraper & Painting machines; Push dozers, or Push cats; Rock crusher; Ross carrier or similar machine; Scoops; Skimmers 2 cu yd capacity & Under: Sheep foot roller (self propelled); Shovels; Skimmer; Scoops; Test hole drilling machines; Tower machine; Tower mixer; Track Tupe & Loaders; Track type forklifts or high lifts; Track jacks & Tampers; Trackors; Sideboom; Trenching machine; Ditching machine; Tunnel lugger; Wheel type end loader; Winch cat; Scoops (All or tournapull).

GROUP 2: Asphalt booster & Heater; Asphalt distributor;

Asphalt plant fireman;Building Elevator; Bull float or flexplane; Concrete finshing machine; Concrete saw, self propelled; Concrete spreader machine; Gravel or stone spreader, Power operated; Hoist automatic; Hoist with one drum & one load line; Oiler on 2 paving mixers when used in tandem boom or winch truck; Ost hole diggers; Mechanical; Road or street sweeper, Self-propelled; Scissors hoist; Seaman tiller; Straw machine; Vibratory compactor; Well drill machine; & Mud jacks.

GROUP 3: Air compressor, Track or self-propelled; Bulk cement batching- plants; Conveyors; Concrete mixers (Except Plant, Paver, Tower) Firement, Generators; Greasers; Light plants; Mechanical theater; Oilers; Power from graders; Power sub-grader; Pug mill, When used other than asphalt operation; Roolers (Except bituminous); Tractors w/o Power attachments regardless of size or type; Truck crane oiler; & driver (one man); Vibratory hammer; Water pump; Welding machine (one 300 amp or over) Combinations of five of any air compressors; Conveyors, Welding Machines, Water pumps; Light plants or Generators shall be in batteries or with in 300 ft.

Group 4: Lattice Boom crawler crane, Lattice Boom truck crane, Telescopic truck mounted crane, Tower crane.

IRON0022-006 06/01/2025

CLARK, COLES, CUMBERLAND, EDGAR, SHELBY, AND VERMILION COUNTIES

	Rates	Fringes
IRONWORKER	$ 38.00	26.39

IRON0046-002 05/01/2024

BROWN, CASS, CHRISTIAN, DEWITT (Western Half), LOGAN, MACON (Except portion East of Decatur), MASON, MENARD, MORGAN, PIKE, SANGAMON, SCHUYLER (Eastern Half), SCOTT, AND SHELBY (Western Half) COUNTIES

	Rates	Fringes
IRONWORKER	$ 37.60	32.94

IRON0380-003 05/01/2024

MACON COUNTY (East of Decatur)

	Rates	Fringes
IRONWORKER	$ 37.71	29.65

IRON0577-004 06/01/2024

ADAMS and SCHUYLER (Western Half) COUNTIES

	Rates	Fringes
IRONWORKER	$ 34.05	25.30

LABO0159-003 05/01/2024

CLARK, COLES, CUMBERLAND, DOUGLAS, EDGAR, MACON, MOULTRIE, AND SHELBY COUNTIES

	Rates	Fringes
LABORER	$ 33.63	31.76

LABO0231-009 05/01/2024

ADAMS COUNTY

	Rates	Fringes
LABORER	$ 33.50	29.33

LABO0231-011 05/01/2024

BROWN, MASON, PIKE, AND SCHUYLER COUNTIES

	Rates	Fringes
LABORER	$ 33.50	29.33

LABO0477-002 05/01/2024

CASS, CHRISTIAN, LOGAN, MENARD, MORGAN, SANGAMON, AND SCOTT COUNTIES

	Rates	Fringes
LABORER	$ 34.04	29.26

LABO0703-002 05/01/2024

CHAMPAIGN, DE WITT, PIATT, and VERMILION COUNTIES

	Rates	Fringes
LABORER	$ 37.47	28.77

PAIN0058-008 05/01/2017

PIKE COUNTY

	Rates	Fringes
PAINTER (Bridge)	$ 32.45	17.12

Epoxy or Toxic-Lead-Based Paint Work-$1.00 Premimum

PAIN0090-002 09/01/2021

ADAMS, BROWN, CASS, LOGAN, MENARD, MORGAN, and SCOTT COUNTIES

	Rates	Fringes
PAINTER	$ 32.23	20.58

Epoxy or Toxic-Lead-Based Paint Work-$1.00 Premimum

All work over 40 ft. above floor or ground level - $1.00 Premium

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PAIN0090-006 09/01/2021

Sangamon County

	Rates	Fringes
PAINTER	$ 32.23	20.58

Epoxy or Toxic-Lead-Based Paint Work-$1.00 Premimum

All work over 40 ft. above floor or ground level - $1.00 Premium

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PAIN0157-001 06/01/2023

FULTON, MARSHALL, MASON, PEORIA, SCHUYLER, TAZEWELL AND WOODFORD COUNTIES

	Rates	Fringes
PAINTER		
Brush, Spray, Pressure Roller, Sandblasting, Bridges, & New Structural Steel Work	$ 40.00	26.90

PAIN0288-002 09/01/2021

DE WITT, MACON, MOULTRIE, PIATT, and SHELBY COUNTIES

	Rates	Fringes
PAINTER		
Brush and Roller	$ 30.50	22.30
Paperhanging and Drywall Taping	$ 30.50	22.30
Spray and Sandblasting	$ 31.25	22.30

Epoxy or Toxic-Lead-Based Paint Work-$1.00 Premimum

Work over 50 ft. above ground or floor level - $1.00 Premium

PAIN0363-001 05/01/2017

CHAMPAIGN, COLES, CUMBERLAND, DOUGLAS, and VERMILION COUNTIES

	Rates	Fringes
PAINTER	$ 35.29	14.50

Epoxy or Toxic-Lead-Based Paint Work-$1.00 Premimum

PAIN1705-002 09/01/2018

CLARK and EDGAR COUNTIES

	Rates	Fringes
PAINTER		
Blasting, Spraying & Pressure Washing	$ 28.37	21.05

Brush & Roller and Wall
Covering Drywall Preparing..$ 27.37 21.05

Epoxy or Toxic-Lead-Based Paint Work-$1.00 Premimum

Brush & Roller work over 30' above ground or floor level - $0.80 Premium

Brush & Roller work over 100' above ground or floor level - $1.80 Premium

Blasting, Spraying & Pressure work over 30' above ground level - $2.30 Premium

Blasting, Spraying & Pressure work over 100' above ground level - $3.30 Premium

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PLAS0018-003 05/01/2025

DEWITT (North of Route 10)

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 38.75	31.92

PLAS0018-021 05/01/2025

DE WITT (South of Route 10) & MACON COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 35.63	31.88

PLAS0018-032 05/01/2017

ADAMS, BROWN, CASS, CHRISTIAN, MENARD, PIKE, and SANGAMON COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 28.64	24.57

PLAS0143-003 05/01/2017

CHAMPAIGN, CLARK, COLES, CUMBERLAND, DOUGLAS, EDGAR, MOULTRIE, PIATT, SHELBY, AND VERMILION COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 33.71	18.91

TEAM0026-004 05/01/2025

CHAMPAIGN, COLES, DEWITT, DOUGLAS, MOULTRIE (East of a line from the Northeast corner of the county extending Southeast in the direction of Findlay (Shelby County) to a point that intersects the Shelby County line), PIATT (East of a line from where the DeWitt County line intersects Route 10 in a Southeast direction towards the Southeast corner of the county), SHELBY (East of an imaginary line beginning at the Northeast border with Moultrie County extending Southwest in the direction of Findlay and continuing to an imaginary point 2.5 miles South of

Middlesworth that parallels the Cumberland County line),
COUNTIES

	Rates	Fringes
TRUCK DRIVER		
Group 1	$ 45.29	25.42
Group 2	$ 45.88	25.42
Group 3	$ 46.15	25.42
Group 4	$ 46.54	25.42
Group 5	$ 47.64	25.42

CLASSIFICATIONS:

GROUP 1: Drivers on 2 axles hauling less than 9 tons; air compressor & welding machines and brooms, including those pulled by separate units; Truck Driver Helper, warehouse employees; Mechanic Helpers; greasers and tiremen; pick-up trucks when hauling material, tools, or workers to and from and on the job site; and forklifts up to 6,000 lb capacity.

GROUP 2: 2 or 3 axles hualing more than 9 tons but hauling less than 16 tons; A-frame winch trucks; hydrolift trucks; Vactor Trucks or similar equipment when used for transportation purposes; Forklift over 6,000 lb.capacity; winch trucks; and four axle combiation units.

GROUP 3: 2, 3 or 4 Axles hauling 16 tons or more; 5-Axles or more combination units; drivers on water pulls; articulated dump trucks; mechanics and working forepersons.

GROUP 4: Low Boy and Oil Distributors.

GROUP 5: Drivers who require special protective clothing while employed on hazardous waste work.

TEAM0135-008 05/01/2025

CLARK and EDGAR COUNTIES

	Rates	Fringes
TRUCK DRIVER		
Group 1	$ 38.55	16.11+a
Group 2	$ 38.97	16.11+a
Group 3	$ 39.18	16.11+a
Group 4	$ 39.44	16.11+a
Group 5	$ 39.44	16.11+a

FOOTNOTE: A. $46.20 per day

CLASSIFICATIONS:

Group 1 - Drivers on 2 axle truckshauling less than 9 ton; Air compressor and welding machines and brooms, including those pulled by separate units; Truck Driver Helpers; Warehouse employees; Mechanic helpers; Greasers and tiremen; fork lifts up to 6,000 pounds capacity

Group 2 - 2 or 3 axle trucks hauling more than 9 ton but hauling less than 16 ton; A-frame winch trucks; Hydrolift trucks; Vactor trucks or similar equipment when used for transportation purposes; Fork lifts over 6,000 pound

capacity; Winch trucks; 4 axle combination units; In the event the Employer desires to use ticket writers that classification shall come under Group II

Group 3 - 2, 3, or 4 axle trucks hauling 16 ton or more; Drivers on water pulls; Articulated Dump Trucks; Mechanics and working forepersons; 5 axle or more combination units

Group 4 - Low Boy; Oil Distributors

Group 5 - Drivers who require special protective clothing while employed on hazardous waste work.

TEAM0279-003 05/01/2025

CHRISTIAN,MACON, MOULTRIE (West of a line from the Northeast corner extending straight Southeast inthe direction of Findlay - Shelby County - to a point that intersects the Shelby County line), PIATT (West of a line frome where the DeWitt County line intersects Route 10 in a Southeast direction towards the Southeast corner of the county), SHELBY (West of an imaginary line beginning at the Northeast border with Moultrie County extending Southwest in the direction of Findlay and continuing to the same point 2.5 miles South of Middlesworth then towards the Northeast corner of Fayette County) COUNTIES

	Rates	Fringes
TRUCK DRIVER		
Group 1	$ 43.28	27.56
Group 2	$ 43.86	27.56
Group 3	$ 44.15	27.56
Group 4	$ 44.53	27.56
Group 5	$ 45.61	27.56

CLASSIFICATIONS:

GROUP 1: Drivers on 2 axles hauling less than 9 tons; air compressor & welding machines and brooms, including those pulled by separate units; Truck Driver Helper, warehouse employees; Mechanic Helpers; greasers and tiremen; pick-up trucks when hauling material, tools, or workers to and from and on the job site; and forklifts up to 6,000 lb capacity.

GROUP 2: 2 or 3 axles hualing more than 9 tons but hauling less than 16 tons; A-frame winch trucks; hydrolift trucks; Vactor Trucks or similar equipment when used for transportation purposes; Forklift over 6,000 lb.capacity; winch trucks; and four axle combiation units.

GROUP 3: 2, 3 or 4 Axles hauling 16 tons or more; 5-Axles or more combination units; drivers on water pulls; articulated dump trucks; mechanics and working forepersons.

GROUP 4: Low Boy and Oil Distributors.

GROUP 5: Drivers who require special protective clothing while employed on hazardous waste work.

TEAM0627-003 05/01/2024

MASON COUNTY

	Rates	Fringes
TRUCK DRIVER		
Group 1	$ 43.24	24.27
Group 2	$ 43.83	24.27
Group 3	$ 44.10	24.27
Group 4	$ 44.49	24.27
Group 5	$ 45.59	24.27

CLASSIFICATIONS:

GROUP 1: Drivers on 2 axles hauling less than 9 tons; air compressor & welding machines and brooms, including those pulled by separate units; Truck Driver Helper, warehouse employees; Mechanic Helpers; greasers and tiremen; pick-up trucks when hauling material, tools, or workers to and from and on the job site; and forklifts up to 6,000 lb capacity.

GROUP 2: 2 or 3 axles hualing more than 9 tons but hauling less than 16 tons; A-frame winch trucks; hydrolift trucks; Vactor Trucks or similar equipment when used for transportation purposes; Forklift over 6,000 lb.capacity; winch trucks; and four axle combiation units.

GROUP 3: 2, 3 or 4 Axles hauling 16 tons or more; 5-Axles or more combination units; drivers on water pulls; articulated dump trucks; mechanics and working forepersons.

GROUP 4: Low Boy and Oil Distributors.

GROUP 5: Drivers who require special protective clothing while employed on hazardous waste work.

TEAM0916-003 05/01/2025

LOGAN, MENARD, MORGAN, PIKE, SANGAMON, SCHUYLER, SCOTT COUNTIES

	Rates	Fringes
TRUCK DRIVER		
Group 1	$ 45.35	25.72
Group 2	$ 45.93	25.72
Group 3	$ 46.25	25.72
Group 4	$ 46.60	25.72
Group 5	$ 47.71	25.72

CLASSIFICATIONS:

GROUP 1: Drivers on 2 axles hauling less than 9 tons; air compressor & welding machines and brooms, including those pulled by separate units; Truck Driver Helper, warehouse employees; Mechanic Helpers; greasers and tiremen; pick-up trucks when hauling material, tools, or workers to and from and on the job site; and forklifts up to 6,000 lb capacity.

GROUP 2: 2 or 3 axles hauling more than 9 tons but hauling less than 16 tons; A-frame winch trucks; hydrolift trucks; Vactor Trucks or similar equipment when used for transportation purposes; Forklift over 6,000 lb.capacity; winch trucks; and four axle combiation units.

GROUP 3: 2, 3 or 4 Axles hauling 16 tons or more; 5-Axles or more combination units; drivers on water pulls; articulated

dump trucks; mechanics and working forepersons.

GROUP 4: Low Boy and Oil Distributors.

GROUP 5: Drivers who require special protective clothing while employed on hazardous waste work.

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION"

"General Decision Number: IL20250002 10/03/2025

Superseded General Decision Number: IL20240002

State: Illinois

Construction Type: Building

Counties: Alexander, Champaign, Christian, Clark, Clay, Coles, Crawford, Cumberland, De Witt, Douglas, Edgar, Edwards, Effingham, Fayette, Ford, Franklin, Gallatin, Hamilton, Hardin, Iroquois, Jackson, Jasper, Jefferson, Johnson, Lawrence, Marion, Massac, Moultrie, Perry, Piatt, Pope, Pulaski, Richland, Saline, Shelby, Union, Vermilion, Wabash, Wayne, White and Williamson Counties in Illinois.

BUILDING CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2025
1	01/10/2025
2	02/14/2025
3	03/07/2025
4	03/14/2025
5	03/21/2025
6	04/04/2025
7	04/18/2025
8	06/20/2025
9	06/27/2025
10	07/04/2025
11	07/11/2025
12	07/18/2025
13	07/25/2025
14	08/01/2025
15	08/29/2025
16	09/05/2025
17	09/26/2025
18	10/03/2025

ASBE0001-004 10/07/2024

ALEXANDER, CHRISTIAN, DE WITT, FAYETTE, JACKSON, JEFFERSON, MARION, MOULTRIE, PERRY, PIATT, SHELBY, AND UNION COUNTIES

	Rates	Fringes
Asbestos Workers/Insulator Includes the application, installation, and cleanup of all insulating materials, protective coverings, coatings, and finishings to all types of mechanical systems	$ 43.48	27.24

ASBE0017-001 06/01/2024

	Rates	Fringes
ASBESTOS WORKER/INSULATOR Includes the application of all insulating materials, protective coverings, coatings, and finishes to all types of mechanical systems	$ 55.02	35.75
Fire Stop Technician	$ 44.02	32.76
HAZARDOUS MATERIAL HANDLER includes preparation, wetting, stripping removal scrapping, vacuuming, bagging and disposal of all insulation materials, whether they contain asbestos or not, from mechanical systems	$ 41.27	32.76

ASBE0017-006 06/01/2024

FORD AND IROQUOIS COUNTIES

	Rates	Fringes
ASBESTOS WORKER/INSULATOR includes the application of all insulating materials; protective coverings, coatings, and finishings to all types of mechanical systems	$ 55.02	35.75
Fire Stop Technician	$ 44.02	32.76
HAZARDOUS MATERIAL HANDLER includes preparation, wetting, stripping removal scrapping, vacuuming, bagging and disposal of all insulation materials, whether they contain asbestos or not, from mechanical systems	$ 41.27	32.76

ASBE0018-002 06/01/2025

CHAMPAIGN, CLARK, DOUGLAS, EDGAR, AND VERMILION COUNTIES

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR Includes application of all insulating materials protective coverings, coatings and finishings to all types of mechancial systems	$ 40.20	26.78

ASBE0037-003 04/07/2025

CLAY, COLES, CRAWFORD, CUMBERLAND, EDWARDS, EFFINGHAM, FRANKLIN, GALLATIN, HAMILTON, HARDIN, JASPER, JOHNSON, LAWRENCE, MASSAC, POPE, PULASKI, RICHLAND, SALINE, WABASH, WAYNE, WHITE, AND WILLIAMSON COUNTIES

	Rates	Fringes
Asbestos Workers/Insulator Includes the application of all insulating materials; protective coverings, coatings, and finishings to all types of mechanical systems	$ 38.19	24.24

BOIL0060-003 01/01/2025

CHAMPAIGN, DE WITT, FORD, IROQUOIS, and VERMILION COUNTIES

	Rates	Fringes
BOILERMAKER	$ 45.23	32.76

BOIL0363-002 01/01/2025

ALEXANDER, CHRISTIAN, CLARK, CLAY, COLES, CRAWFORD, CUMBERLAND, DOUGLAS, EDGAR, EDWARDS, EFFINGHAM, FAYETTE, FRANKLIN, GALLATIN, HAMILTON, HARDIN, JACKSON, JASPER, JEFFERSON, JOHNSON, LAWRENCE, MARION, MASSAC, MOULTRIE, PERRY, PIATT, POPE, PULASKI, RICHLAND, SALINE, SHELBY, UNION, WABASH, WAYNE, WHITE, AND WILLIAMSON COUNTIES

	Rates	Fringes
BOILERMAKER	$ 45.50	35.30

BRIL0006-007 06/01/2016

DE WITT COUNTY

	Rates	Fringes
Bricklayer, Caulker, Cleaner, Pointer & Stonemason	$ 30.59	23.19

BRIL0006-011 06/01/2017

DE WITT COUNTY

	Rates	Fringes
Base Machine Men	$ 31.13	21.09
Marble, Tile & Terrazzo Finisher	$ 31.13	21.09
Marble, Tile & Terrazzo Workers	$ 32.87	21.09

BRIL0006-015 06/01/2019

FORD (North of Roberts), AND IROQUOIS COUNTIES

	Rates	Fringes
BRICKLAYER	$ 44.37	24.70

BRIL0006-021 06/01/2017

FORD (North of Roberts) & IROQUOIS COUNTIES

	Rates	Fringes
MARBLE SETTER	$ 42.98	21.79

BRIL0008-001 05/01/2019

ALEXANDER, CLAY, EDWARDS, FRANKLIN, GALLATIN, HAMILTON, HARDIN, JACKSON, JEFFERSON, JOHNSON, LAWRENCE, MASSAC, PERRY, POPE, PULASKI, RICHLAND, SALINE, UNION, WABASH, WAYNE, WHITE, and WILLIAMSON COUNTIES

	Rates	Fringes
Bricklayer, Caulker, Cleaner, Pointer & Stonemason	$ 30.79	21.69

BRIL0008-003 05/01/2019

CHAMPAIGN, CLARK, COLES, CRAWFORD, CUMBERLAND, DOUGLAS, EDGAR, EFFINGHAM, FORD, JASPER, PIATT, and VERMILION COUNTIES

	Rates	Fringes
Marble Setter, Terrazzo Worker & Tile Setter	$ 32.53	19.38
Marble, terrazzo and tile finisher	$ 31.03	19.38

BRIL0008-004 05/01/2020

CHRISTIAN COUNTY

	Rates	Fringes
Marble & Tile Setter and Terrazzo Worker	$ 33.65	20.70
Marble, terrazzo and tile finisher	$ 32.13	20.70

BRIL0008-005 08/01/2017

FAYETTE AND MARION COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer, Stonemason, Marble Mason, Tile Layer, Pointer, Cleaner, and Caulker	$ 33.13	22.05

BRIL0008-015 05/01/2019

CHAMPAIGN, COLES, DOUGLAS, EDGAR, FORD(South of Roberts), PIATT & VERMILION COUNTIES

	Rates	Fringes
BRICKLAYER	$ 32.45	24.43

BRIL0008-017 05/01/2020

MOULTRIE and SHELBY COUNTIES

	Rates	Fringes
BRICKLAYER		
Caulkers, Cement Block Layers, Cleaners, Marble Setters, Pointers, Terrazzo Workers, and Tile Setters	$ 33.49	24.93

BRIL0008-020 05/01/2020

CHRISTIAN COUNTY

	Rates	Fringes
Bricklayer, Caulker, Cleaner,		

Pointer & Stonemason.....$ 33.49 24.93

BRIL0008-031 05/01/2020

CLARK, CRAWFORD, CUMBERLAND, EFFINGHAM & JASPER COUNTIES

	Rates	Fringes
BRICKLAYER	$ 31.56	22.28

CARP0237-017 05/01/2021

DE WITT AND FORD (Northern Portion) COUNTIES

	Rates	Fringes
Carpenter/Lather	$ 34.29	29.94
Piledriver	$ 35.29	29.94

CARP0237-022 05/01/2021

FORD COUNTY (Southern Portion)

	Rates	Fringes
Carpenter/Lather	$ 33.58	29.94
Piledriver	$ 34.58	29.94

CARP0243-002 05/15/2020

CHAMPAIGN, EDGAR AND VERMILION COUNTIES

	Rates	Fringes
Carpenter/Lather	$ 37.11	24.85
Piledriver	$ 38.11	24.85

CARP0243-005 05/15/2020

COLES, CUMBERLAND, DOUGLAS, EFFINGHAM, JASPER, MOULTRIE, AND SHELBY COUNTIES

	Rates	Fringes
Carpenter/Lather	$ 33.71	28.25
Piledriver	$ 34.71	28.25

CARP0243-013 05/01/2017

CLARK COUNTY

	Rates	Fringes
Carpenter/Lather	$ 36.04	21.34
Piledriver	$ 37.04	21.34

CARP0270-003 05/01/2019

CHRISTIAN COUNTY

	Rates	Fringes
Carpenter/Lather	$ 32.83	27.45
Piledriver	$ 33.83	27.45

CARP0270-017 05/15/2020

PIATT COUNTY

	Rates	Fringes
Carpenter/Lather	$ 33.36	28.60
Piledriver	$ 34.36	28.60

CARP0501-001 05/01/2017

CRAWFORD COUNTY

	Rates	Fringes
CARPENTER	$ 32.14	25.24

CARP0555-014 06/01/2022

IROQUOIS COUNTY

	Rates	Fringes
CARPENTER Carpenter, Drywaller, Millwright, Piledriver, and Soft Floor Layer	$ 42.96	39.96

CARP0634-001 05/01/2021

CLAY, EDWARDS, FAYETTE, HAMILTON, JEFFERSON, LAWRENCE, MARION, RICHLAND, WABASH, WAYNE, and WHITE COUNTIES

	Rates	Fringes
CARPENTER (Lather, Piledriver, and Millwright)	$ 38.62	18.90
Carpet Installer (Carpet, Linoleum, Hardwood, and Tile Layer)	$ 36.08	18.90

CARP0640-001 05/01/2021

ALEXANDER, FRANKLIN, HARDIN, MASSAC, JACKSON, PERRY, POPE, JOHNSON, GALLATIN, PULASKI, SALINE, UNION, and WILLIAMSON COUNTIES

	Rates	Fringes
CARPENTER (Lather, Piledriver, and Millwright)	$ 38.62	18.90
Carpet Installer (Carpet, Linoleum, Hardwood, and Tile Layer)	$ 36.08	18.90

DIVERS (Receive 1 1/2 times Carpenter's rate plus fringe benefits and $25.00 per day for equipment)

CARP1051-004 05/15/2020

CHAMPAIGN, CHRISTIAN, CLARK, COLES, CRAWFORD, CUMBERLAND,

DOUGLAS, EDGAR, EFFINGHAM, JASPER, MOULTRIE, PIATT, SHELBY AND VERMILION COUNTIES

	Rates	Fringes
MILLWRIGHT	$ 33.06	29.36

CARP1051-008 05/15/2020

DE WITT AND FORD COUNTIES

	Rates	Fringes
MILLWRIGHT	$ 33.06	30.04

ELEC0016-002 06/01/2025

WABASH COUNTY

	Rates	Fringes
ELECTRICIAN	$ 46.14	21.67

ELEC0146-001 06/01/2025

CHRISTIAN, COLES, CUMBERLAND, DE WITT (Excluding Rutledge, Santa Anna, Waynesville, and Wilson TWPS), DOUGLAS (Southern Half), EFFINGHAM (Banner, Bishop, Douglas, Liberty, Lucas, Moccasin, St. Francis, Summit and Teulopolis TWPS), FAYETTE (Hurricane, S. Hurricane, Ramsey, Bowling Green, Carson, and Loudon TWPS), MACON, MOULTRIE, PIATT (Excluding Blue Ridge, Sangamon and Monticello TWPS), AND SHELBY COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 48.00	24.16

ELEC0176-009 06/01/2023

FORD (North of Lyman TWP), AND IROQUOIS (Excluding Artesia, Fountain Crrek, Loda, Lovejoy, Pegeon Grove, and Prairie TWPS) COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 50.45	44.96

ELEC0176-016 06/01/2020

FORD and IROQUOIS COUNTIES

	Rates	Fringes
CATV Installer	$ 37.50	32.78

ELEC0197-004 06/01/2024

DE WITT COUNTY (Waynesville, Wilson, and Rutledge)

	Rates	Fringes
ELECTRICIAN	$ 43.86	23.72

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* ELEC0197-007 09/01/2025

BUILDING

DEWITT (Northside), WESTERN (Northside), MCLEAN (Southside),
and WOODFORD (Southside) COUNTIES

	Rates	Fringes
ELECTRICAL LOW VOLTAGE WIRING INSTALLER Installation, service and maintenance of low-voltage systems which utilizes the transmission and/or transference of voice, sound, vision, or digital for commercial, education, security and entertainment purposes for the following: TV monitoring and surveillance, background/foreground music, intercom and telephone interconnect, field programming, inventory control systems, microwave transmission, multi-media, multiplex, radio page, school, intercom and sound burglar alarms and low voltage master clock systems	$ 40.63	20.47

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* ELEC0538-003 06/01/2025

IROQUOIS (Fountain Creek, Lovejoy & Prairie Twps), VERMILION,
and WABASH COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 41.00	27.36

 ELEC0538-007 09/01/2024

BUILDING

IROQUOIS (Southeastern side), and VERMILION COUNTIES

	Rates	Fringes
ELECTRICAL LOW VOLTAGE WIRING INSTALLER Installation, service and maintenance of low-voltage systems which utilizes the transmission and/or transference of voice, sound, vision, or digital for commercial, education, security and entertainment purposes for the		

following: TV monitoring
and surveillance,
background/foreground
music, intercom and
telephone interconnect,
field programming,
inventory control systems,
microwave transmission,
multi-media, multiplex,
radio page, school,
intercom and sound burglar
alarms and low voltage
master clock systems.....$ 38.88 19.02

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* ELEC0601-001 09/01/2025

CHAMPAIGN, DE WITT (Santa Anna Twp), DOUGLAS (Northern Half), FORD (South of Benton Twp), IROQUOIS (Artesia, Pigeon Grove & Loda Twps), and PIATT (Blue Ridge, Sangamon, & Monticello Twps) COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 49.63	22.51

ELEC0601-010 09/01/2024

BUILDING

CHAMPAIGN, DEWITT (Northeast side), DOUGLAS (Northeast side), FORD (Southside), IROQUIOS (Southwest side), LASALLE (Southside), LIVINGSTON, MARSHALL (Eastside), PIATT (Northeast side), PUTNAM (Southeast side), and WOODFORD (Northeast side) COUNTIES

	Rates	Fringes
ELECTRICAL LOW VOLTAGE WIRING INSTALLER	$ 36.25	21.65

Installation, service and maintenance of low-voltage systems which utilizes the transmission and/or transference of voice, sound, vision, or digital for commercial, education, security and entertainment purposes for the following: TV monitoring and surveillance, background/foreground music, intercom and telephone interconnect, field programming, inventory control systems, microwave transmission, multi-media, multiplex, radio page, school, intercom and sound burglar alarms and low voltage master clock systems.

ELEC0702-001 01/01/2025

ALEXANDER, CLAY, EDWARDS, EFFINGHAM (Excluding Banner, Bishop, Douglas, Liberty, Lucas, Moccasin, St. Francis, Summit and Teulopolis TWPS), FAYETTE (Excluding Hurricane, S. Hurricane, Ramsey, Bowling Green, Carson and Loudon TWPS), FRANKLIN, GALLATIN, HAMILTON, HARDIN, JACKSON, JEFFERSON, JOHNSON, MARION, MASSAC, PERRY, POPE, PULASKI, SALINE, UNION, WAYNE, WHITE, AND WILLIAMSON COUNTIES

	Rates	Fringes

ELECTRICIAN.....$ 52.14 29.14

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* ELEC0702-016 09/01/2024

BUILDING

ALEXANDER, BOND (Eastside), CLAY, CLINTON (Eastside), EDWARDS, EFFINGHAM (Southwestern side), FAYETTE (Southside), FRANKLIN, GALLATIN, HAMILTON, HARDIN, JACKSON, JEFFERSON, JOHNSON, MARION, MASSAC, PULASKI, PERRY, POPE, RANDOLPH (Southeastern side), SALINE, UNION, WASHINGTON (Southeastern side), WAYNE, WHITE, and WILLIAMSON COUNTIES

	Rates	Fringes
ELECTRICAL LOW VOLTAGE WIRING INSTALLER.....	$ 38.44	19.37

Installation, service and maintenance of low-voltage systems which utilizes the transmission and/or transference of voice, sound, vision, or digital for commercial, education, security and entertainment purposes for the following: TV monitoring and surveillance, background/foreground music, intercom and telephone interconnect, field programming, inventory control systems, microwave transmission, multi-media, multiplex, radio page, school, intercom and sound burglar alarms and low voltage master clock systems.

ELEC0725-005 10/01/2024

CLARK, CRAWFORD, EDGAR, JASPER, LAWRENCE, AND RICHLAND COUNTIES

	Rates	Fringes
ELECTRICIAN.....	$ 43.30	25.32

ELEV0003-006 01/01/2025

ALEXANDER, CLAY, EDWARDS, FRANKLIN, GALLATIN, HAMILTON, HARDIN, JACKSON, JEFFERSON, JOHNSON, LAWRENCE, MARION, MASSAC, PERRY, POPE, PULASKI, RICHLAND, SALINE, UNION, WABASH, WAYNE, WHITE and WILLIAMSON COUNTIES

	Rates	Fringes
ELEVATOR MECHANIC.....	$ 62.73	38.435+a+b

FOOTNOTES:

a) Employer contributes 8% of regular basic hourly rate as as vacation pay credit for employees with more than 5 years of service, and 6% for less than 5 years of service

b) Eight paid holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day Friday after Thanksgiving Day, Veterans' Day and Christmas Day.

ELEV0034-004 01/01/2025

	Rates	Fringes

ELEVATOR MECHANIC.....$ 60.17 38.435+a+b

FOOTNOTES:

a) Employer contributes 8% of regular basic hourly rate as vacation pay credit fore employees with more than 5 years of service; and 6% for 6 months to 5 years of service

b) Paid Holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; the Friday after Thanksgiving Day; Veterans' Day and Christmas Day

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ELEV0055-002 01/01/2025

	Rates	Fringes
ELEVATOR MECHANIC	$ 57.99	38.435+a+b

FOOTNOTES:

A. Employer contributes 8% of regular basic hourly rate as vacation pay credit for employees with more than 5 years of service, and 6% for under 5 years of service.

B. Paid Holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; Day after Thanksgiving; Veterans' Day & Christmas Day

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ENGI0318-001 04/01/2025

ALEXANDER, FRANKLIN, GALLATIN, HAMILTON, HARDIN, JACKSON, JOHNSON, MASSAC, POPE, PULASKI, SALINE, UNION, WHITE, AND WILLIAMSON COUNTIES

	Rates	Fringes
OPERATOR: Power Equipment		
Class A	$ 40.13	32.00+a
Class B	$ 38.23	32.00+a
Class C	$ 30.83	32.00+a
River		
Class 1	$ 40.23	32.00+a
Class 2	$ 36.78	32.00+a

Class A: All Off Road Material Hauling Equipment, All Terrain Crane, Articulated Dump, Asphalt Machine Spreader, Asphalt Plant Assistant Operator, Asphalt Plant Operator, Asphalt Widener, Assistant Operator on Rotomills, Autograder, Automatic Slipform Pavers, Backend Man on Asphalt Machine, Backhoes, Barrel Grappler Devices (All), Blacksmith, Blade Operators (All), Boat Operators (all) Bridges, Boat Pilots requiring certification and/or licensing, Dams & Waterways, Boilers, Boom or Winch Cat, Boom or Winch Type Trucks, Boring Machines-Horizontal, Clamshell, Orange Peel Operator, Concrete Breaker, Concrete Groover, Concrete Grinder, Concrete Curb Machine, Concrete Finish Machine or Spreader Operator, Concrete Mixer Paver, Concrete Pump Truck, Concrete Plant Operator, Concrete Wheel Saw Operators, Cranes(All) Truck/Track/Rubber, Crane (Overhead) Operator, Derrick Guy or Derrick Trucks, Ditching Machines (All), Dozer Operators, Dragline or

Shovel Operators, Dredge Booster Pump, Dredge Engineman, Dredge Operator/Leverman, Drill Cat w/Compressor Mounted, Drilling or Boring Machine Rotary-Self-Propelled, Endloaders (All) Track/Rubber Elevating Grader, Flexplane, Forklifts/Tele-Handlers (All), Geothermal Well Drilling, GPS on machines already under the jurisdiction of Local 318, Gradall; Greasers, Heavy Equipment Robotics Operator, Hi-Lift, Hoists, Hosting Engine, Horizontal Directional Drill Operator, Incinerators (Haz-Mat only), Laser Screed, Locomotive/Operator, Master Mechanic, Mixers 21 cu. ft. or over, Motor Patrol, Pile driver operator, Pulls & Scrapers, Power Pac & Controls (Pile Driving), Pug mill, Pulverizer or Tillers, Push Cats, Quad Trac, Rotomills, Rotating Cab Forklifts, Rubber Tired Farm Tractor with Attachments over 1/2 yd., Self-Propelled Chip Spreader, Self-Propelled Roller w/Attachments, Shot Blaster/Bridge Deck, Shuttle Buggie, Side booms, Skid loader (Skid steers), Skimmer Scoop, Spyder Crane, Stationary Rock Slinger, Trackhoe and all attachments, Trench Machine Opeator, Tuggers, Ultra High Pressure Water Jet Cutting Machine, Vacuum, Vacuum Blasting Machine Operator, Vac Jet, Welders, Well or Caisson Drills, Well Point Pumps-2 or more, Wood Chipper w/Tractor.

Class B: Oilers classified as Assistant Operators, Air Track Drill/Compressor, All Machines used to Sweep, Clean, Broom or remove debris or snow, Any type tractor pulling Roller or Disc, Automatic Bins or Scales w/Compressor or Generator, Bulk Cement Plant w/Separate Compressor, Concrete Curb Machine requiring Electronics, Concrete Plant Assistant Operators, Concrete or Pump crete Pumps, Deck Hand on Boats, Dredge Assistant Operator/Mate, Power Broom, Self-Propelled Roller/Compactor, Straw Mulcher Blower, Stump Cutter Machine, Two Air Compressors (220 CFM or over), Two Air Track Drills. Air Compressor w/valve driving piling, Assistant operator (where required refer to article vii section 9), Elevator Operator, Form Grader, Man Lift (scissor lift) when lifting materials, Pildriver activating air or hydraulic valve regardless of location, Rubber-tired farm type tractor w/Blade/Bulldozer/Auger/Hi-lift of 1/2 yard or less, Self-propelled concrete saw, Self-propelled robotics roller in use two continuous hours or more shall be manned by an operating engineer, Self-propelled vibrator, Truck crane assistant operator, Two Conveyors.

Class C: Air Compressor (220 CFM or over) one, Air Track Drill one, Automatic Bin, Belt Drag Machine, Bulk Cement Plant w/built-in compressor running off same motor or electric motor, fireman or switchman, Mechanic in permanent shops without separate signed Collective Bargaining Agreements (Nov. 1 through March 31), Mechanical plasterer applicator, Pipe Tract Jack, Power Broom, Self-propelled from tamper, Trac-Air, Mixers - less than 21 cu.ft., Mortar Mixer w/ski or pump, Mud Jacks, one well point pump, Wood Chipper.
One Operating Engineer may operate or maintain any combination of the following pieces of equipment, not to exceed four (4), which shall be within reasonable distance; such combination may include the equipment in this classification: Air Compressor (under 220 CFM) Four, Light Plants, Generators, Pumps, Conveyors, Motor Driven Heaters (2), Welding Machines, Ulmac or Equal Spreader

River Class 1: All Off Road Material Hauling Equipment, All Terrain Crane, All Power Boat Operators, Articulated Dump,

Asphalt Machine Spreader, Asphalt Plant Operator, Asphalt Widener, Autograder, Automatic Slipform Pavers, Backhoes, Barrel Grappler Devices (All), Blacksmith, Blade Operators (All), Boat Pilots requiring certification and or licensing, Boat Operators (all) Bridges, Dams & Waterways, Boilers, Boom or Winch Cat, Boom or Winch Type Trucks, Boring Machines-Horizontal, Clamshell, Orange Peel Operator, Concrete Breaker, Concrete Curb Machine, Concrete Finish Machine or Spreader Operator, Concrete Mixer Paver, Concrete Pump Truck, Concrete Plant Operator, Concrete Wheel Saw Operators, Cranes(All) Truck/Track/Rubber, Crane (Overhead) Operator, Derrick Guy or Derrick Trucks, Ditching Machines (All), Dozer Operators, Dragline or Shovel Operators, Dredge Booster Pump, Dredge Engineman, Dredge Operator/Leverman, Drill Cat w/Compressor Mounted, Drilling or Boring Machine Rotary-Self-Propelled, Endloaders (All) Track/Rubber Elevating Grader, Flexplane, Forklifts/Tele-Handlers (All), Geothermal Well Drilling, GPS on machines already under the jurisdiction of Local 318, Gradall; Greasers, Heavy Equipment Robotics Operator, Hi-Lift, Hoists, Hosting Engine, Horizontal Directional Drill Operator, Incinerators (Haz-Mat only), Laser Screed, Locomotive/Operator, Master Mechanic, Mixers 21 cu. ft. or over, Motor Patrol, Piledriver operator, Pulls & Scrapers, Power Pac & Controls (PileDriving), Pug mill, Pulverizer or Tillers, Push Cats, Quad Trac, Rotating Cab Forklifts, Rotomills, Rubber Tired Farm Tractor with Attachments over 1/2 yd., Self-Propelled Chip Spreader, Self-Propelled Roller w/Attachments, Shuttle Buggie, Side booms, Skid loader (Skidsteers), Skimmer Scoop, Spyder Cranes, Trackhoe and all attachments, Trench Machine Opeator, Tuggers, Ultra High Pressure Water Jet Cutting Machine, Vacuum, Vacuum Blasting Machine Operator, Vac Jet, Welders, Well or Caisson Drills, Well Point Pumps-2 or more, Wood Chipper w/Tractor.

River Class 2: Assistant Operators required on All terrain cherry picker w/over 40 ton lifting capacity, Crane, Deckhand on all rivers, lakes, and tributaries, Dinky or standard locomotive, Ditching machine (80 h.p. and over), Dragline, Dredge, Gradall, Guy Derrick, Assitant operators or firman on crane, Piledriver, Shovel, Trenching Machine, Truck Crane.

Footnote A - Hazardous Waste Premium: Level (A)-receive $3.00 above rate; Level (B)-receive $2.00 above rate; Level (C)-receive $1.50 above rate; Level (D)-receive $1.00 above rate.

ENGI0520-011 08/01/2025

FAYETTE, JEFFERSON, MARION, and PERRY COUNTIES

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
Group 01	$ 48.70	39.10
Group 02	$ 47.57	39.10
Group 03	$ 43.09	39.10
Group 04	$ 43.15	39.10
Group 05	$ 43.15	39.10
Group 06	$ 51.45	39.10
Group 07	$ 43.80	34.95
Group 08	$ 44.10	34.95

Group 09	$ 49.70	39.10
Group 10	$ 45.25	34.95
Group 11	$ 50.70	39.10
Group 12	$ 51.70	39.10

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Cranes, Draglines, Shovels, Skimmer Scoops, Clamshells or Derrick Boats, Pile Drivers, Crane-Type Backhoes, Asphalt Plant Operators, Concrete Plant Operators, Dredges, Asphalt Spreading Machines, Screws on Asphalt Spreading Machines, All Locomotives, Cable Ways or Tower Machines, Hoists, Hydraulic Backhoes, Ditching Machines, or Backfiller, Cherrypickers, overhead Cranes, Roller, Steam or Gas, Concrete Pavers, Excavator Concrete Breakers, Concrete Pumps, Bulk Cement Plants, Cement Pumps, DerrickType Drills, Boat Operators, Motor Graders or Pushcats, Scoops or Toumapulls, Bulldozers, Endloaders or Fork Lifts, Power Blade or Elevating Graders, Winch Cats, Boom or Winch Trucks or Boom Tractors, Pipe Wrapping or Painting Machines, Asphalt Plant Engineer, Journeyman Lubricating Engineer, Drills (other than derrick type), Mud Jacks, or Well Drilling Machines, Boring Machines or Track Jacks, Mixers, Conveyors (two), Air Compressors (two) Water Pumps, regardless of size (two), Welding Machines (two), Siphons or Jets (two), Winch Head or Apparatuses (two), Light Plants (two), Waterblasters (two), all Tractors, regardless of size (straight tractor only), Fireman on Stationary Boilers, Automatic Elevators, Form Grading Machines, Finishing Machines, Power Sub-Grader or Ribbon Machines, Longitudinal Floats, Distributor Operators on Trucks, Winch Heads or Apparatuses (one), Mobil Track air and heaters (two to five), Heavy Equipment Greaser, Relief Operator, Assistant Master Mechanic and Heavy Duty Mechanic, concrete saws of all types and sizes with their attachments, gobhoppers, excavators all sizes, the repair, greasing, and fueling of all diesel hammers, the operation, set-up and cleaning ofbidwells, concrete placement booms, the alterations, repair of all barges, water blasters of all sizes and their clutches, mobile lifts, hydraulic jacks where used for hoisting, diesel or gas powered flashing sings used for traffic control, micro pavers, log skiders, iceolators used on and off of pipeline, condor cranes, drill rigs of all sizes, bow boats, survey boats, ross carriers, bob-cats and all their attachments, skid steer loaders and all their attachments, creter crane, direct drive electric motors the bolting and unbolting the adjusting and shimming, (dewateringjobs, whirley crane, conveyor belts) etc., batch plants (all sizes), roto mills, conveyors systems of any size and any configuration, hydroseeders and strawblowers all sizes, operation, repair, service of all vibratory hammers, all power pacs and their controls regardless of location, curtains or brush burning machines, stump cutter machines, grout machines regardless of size, Nail launchers when mounted on a machine or self-propelled, con-cover machines, Goldhofer and similar S.P.M.T. (self-propelled modular transpmiers) heavy transport units and all Operators (except those listed below).

Group 2: Assistant Operators

GROUP 3: Air Compressor One; Water Pump regardless of size One; Welding Machine One; 1-Bag Mixer One; Conveyor One; Siphon or Jet; Light Plant One; Heater One; Immobile Track

Air One

GROUP 4: Firemen on Whirlies and Asphalt Spreader Oiler; Heavy Equipment Oilers; Truck Cranes; Monigans; Large over 65 tons capacity; Concrete Plant OIler and Black Top Plant Oiler

GROUP 5: Oilers

GROUP 6: Operators on equipment with Booms, including Jibs, 100 ft and over, but less than 150 ft

GROUP 7: Operators on equipment with Booms, including Jibs, 150 ft and over, but less than 200 ft

GROUP 8: Operators on equipment with Boomns, including Jibs, 200 ft and over; Tower Cranes, and Whirley Cranes

GROUP 9: Certified crane Operators, Below 17.5 tons, when requested by the Contractor or required by the Owner.

GROUP 10: Certified crane Operators 17.5 tons and above, when requested by the Contractor or required by the Owner.

GROUP 11: Master Mechanic

GROUP 12: Licensed Boat Pilot

ENGI0841-005 04/01/2023

CHAMPAIGN, CLARK, COLES, CUMBERLAND, DOUGLAS, EDGAR, MOULTRIE, and VERMILION COUNTIES

	Rates	Fringes
OPERATOR: Power Equipment		
GROUP 1	$ 45.15	26.00
GROUP 2	$ 30.05	26.00

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Power Cranes, Draglines, Derricks, Shovels, Gradalls, Mechanics, Tractor Highlift, Tournadozer, Concrete Mixers with Skip, Tournamixer, Two-Drum Machine, One-Drum Hoist with Tower or Boom, Cableways, Tower Machines, Motor Patrol, Boom Tractor, Boom or Winch Truck, Winch or Hydraulic Boom Truck, Truck Crane, Tournapull, Tractor Operating Scoops, Bulldozer, Push Tractor, Asphalt Planer, Finishing Machine on Asphalt, Large Rollers on Earth, Rollers on Asphalt Mix, Ross Carrier or Similar Machine, Gravel Processing Machine, Asphalt Plant Engineer, Paver Operator, Farm Tractor with Half Yard Bucket and/or Backhoe Attachments, Dredge Engineer, or Dredge Operator, Central Mix Plant Engineer, CMI or Similar Type Machine, Truck or Skid Mounted Concrete Pump, Tower Crane, Engine or Rock Crusher Plant, Concrete Plant Engineer, Ditching Machine with Dual Attachment, Tractor Mounted Loaders, Cherry Picker, Hydro Crane, Standard or Dinney Locomotives, Scoopmobiles, Euclid Loader, Soil Cement Machine, Back Filler, Elevating Machine, Power Blade, Drilling Machines Including Well Testing, Caissons, Shaft or Any Similar Type Drilling Machines, Motor Driven Paint Machine, Pipe Cleaning Machine, Pipe Wrapping Machine, Pipe Bending

Machine, Apsco Paver, Boring Machine, (Head Equipment Greased), Barber- Greene Loaders, Formless Paver, (Well Point System), Concrete Spreader, Hydra Ax, Span Saw and Similar Types, Marine Scoops, Brush Mulcher, Brush Burner, Mesh Placer, Tree Mover, Helicopter Crew (3), Piledriver - Skid or Crawler, Stump Remover, Root Rake, Tug Boat Operator, Refrigerating Machine, Freezing Operator, Chair Cart-Self Propelled, Hydra Seeder, Straw Blower, Power Sub Grader, Bull Float, Finishing Machine, Self-Propelled Pavement Breaker (Backhoe Attached), Lull (or Similar Type Machine), Two Air Compressors, Compressors Hooked in Manifold, Overhead Crane, Chip Spreader, Mud Cat, Sull-Air Fork Lifts (Except When Used For Landscaping Work), Soil Stabilazer (Seaman Tiller, Bo Mag, Rago Gator and Similar Types or Equipment), Tube Float, Spray Machine, Curing Machine, Concrete or Asphalt Mil

GROUP 2: Concrete Mixers Without Skips, Rock Crusher, Ditching Machine Under 6', Curbing Machine, one Drum Machines without Tower or Boom, Air Tugger, Self-Propelled Concrete Saw, Machine- Mounted Post Hole Digger, Two to Four Generators, Water Pumps, or Welding Machines, within 400ft., Air Compressor 600 cu. ft. and Under, Rollers on Aggregate and Seal Coat Surfaces, Fork Lifts (When Used For Landscaping Work, Concrete and Blacktop Curb Machine, Farm Tractor with less than Half Yard Bucket, One Water Pump, Oilers, Air Valves or Steam Valves, One Welding Machine, Truck Jack, Mud Jack, Gunnite Machine, House Elevators when used for Hoisting Material, Engine Tenders, Wagon Drill, Flex Plane, Conveyor, Siphons and Pulsometer, Switchman, Fireman on Paint Pots, Fireman on Asphalt Plants, Distributor Operators on Trucks, Tampers, Self- Propelled Power Broom, Striping Machine (Motor Driven), Form Tamper, Bulk Cement Plant Equipment Greaser, Deck Hands, Truck Crane Oiler-Driver, Cement Blimps, Form Grader, Temporary Heat, Throttle Valve, Farm Tractor, Super Sucker (and Similar Type of Equipment)

ENGI0841-006 04/01/2023

CLAY, CRAWFORD, EDWARDS, EFFINGHAM, JASPER, LAWRENCE, RICHLAND, WABASH, and WAYNE COUNTIES

	Rates	Fringes
OPERATOR: Power Equipment		
GROUP 1	$ 45.15	26.00
GROUP 2	$ 30.05	26.00

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Power Cranes, Draglines, Derricks, Shovels, Gradalls, Mechanics, Tractor Highlift, Tournadozer, Concrete Mixers with Skip, Tournamixer, Two-Drum Machine, One-Drum Hoist with Tower or Boom, Cableways, Tower Machines, Motor Patrol, Boom Tractor, Boom or Winch truck, Winch or Hydraulic Boom Truck, Truck Crane, Tournapull, Tractor Operating Scoops, Bulldozer, Push Tractor, Asphalt Planer, Finishing Machine on Asphalt, Large Rollers on Earth, Rollers on Asphalt Mix, Ross Carrier or Similar Machine, Gravel Processing Machine, Asphalt Plant Engineer, Paver Operator, Farm Tractor with Half Yard Bucket and/or Backhoe Attachments, Dredge Engineer, or Dredge Operator,

Central Mix Plant Engineer, CMI or Similar Type Machine, Truck or Skid Mounted Concrete Pump, Tower Crane, Engine or Rock Crusher Plant, Concrete Plant Engineer, Ditching Machine with Dual Attachment, Tractor Mounted Loaders, Cherry Picker, Hydro Crane, Standard or Dinkey Locomotives, Scoopmobiles, Euclid Loader, Soil Cement Machine, Back Filler, Elevating Machine, Power Blade, Drilling Machines Including Well Testing, Caissons, Shaft or Any Similar Type Drilling Machines, Motor Driven Paint Machine, Pipe Cleaning Machine, Pipe Wrapping Machine, Pipe Bending Machine, Apsco Paver, Boring Machine, (Equipment Greased), Barber- Greene Loaders, Formless Paver, (Well Point System), Concrete Spreader, Hydra Ax, Span Saw and Similar Types, Marine Scoops, Brush Mulcher, Brush Burner, Mesh Placer, Tree Mover, Helicopter Crew (3), Piledriver - Skid or Crawler, Stump Remover, Root Rake, Tug Boat Operator, Refrigerating Machine, Freezing Operator, Chair Cart-Self Propelled, Hydra Seeder, Straw Blower, Power Sub Grader, Bull Float, Finishing Machine, Self-Propelled Pavement Breaker (Backhoe Attached), Lull (or Similar Type Machine), Two Air Compressors, Compressors Hooked in Manifold, Overhead Crane, Chip Spreader, Mud Cat, Sull-Air Fork Lifts (Except When Used For Landscaping Work), Soil Stabilazer (Seaman Tiller, Bo Mag, Rago Gator and Similar Types or Equipment), Tube Float, Spray Machine, Curing Machine, Concrete or Asphalt Milling Machine, Snooper Truck Operator.

GROUP 2: Concrete Mixers Without Skips, Rock Crusher, Ditching Machine Under 6', Curbing Machine, one Drum Machines without Tower or Boom, Air Tugger, Self-Propelled Concrete Saw, Machine- Mounted Post Hole Digger, Two to Four Generators, Water Pumps, or Welding Machines, within 400ft., Air Compressor 600 cu. ft. and Under, Rollers on Aggregate and Seal Coat Surfaces, Fork Lifts (When Used For Landscaping Work, Concrete and Blacktop Curb Machine, Farm Tractor with less than Half Yard Bucket, One Water Pump, Oilers, Air Valves or Steam Valves, One Welding Machine, Truck Jack, Mud Jack, Gunnite Machine, House Elevators when used for Hoisting Material, Engine Tenders, Wagon Drill, Flex Plane, Conveyor, Siphons and Pulsometer, Switchman, Fireman on Paint Pots, Fireman on Asphalt Plants, Distributor Operators on Trucks, Tampers, Self- Propelled Power Broom, Striping Machine (Motor Driven), Form Tamper, Bulk Cement Plant Equipment Greaser, Deck Hands, Truck Crane Oiler_Driver, Cement Blimps, Form Grader, Temporary Heat, Throttle Valve, Farm Tractor, Super Sucker (and Similar Type of Equipment)

ENGI0965-005 05/01/2023

CHRISTIAN, DE WITT, PIATT, and SHELBY COUNTIES

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
Group 1	$ 40.71	28.75
Group 2	$ 38.18	28.75
Group 3	$ 34.30	28.75
Group 4	$ 42.32	28.75

PREMIUM PAY-

CRANES WITH BOOMS - 120-200 ft. 1.00 per hour; 150 ft. .02 Per Foot For Each Foot Above 200; MULTIPLE UNIT MACHINES-

1.00 per hour; UNDERGROUND WORK-.50 per hour; UNDER AIR PRESSURE- .50 per hour; LONG BOOMS ON STATIONARY CRANES - 1.00 per hour. Above Long Boom Scale.

HAZARDOUS WASTE/ASBESTOS REMOVAL WORKERS:

Level A: (highest level of respiratory, skin, and eye protection) receives $2.00 per hour above journeyman.

Level B: (same as level A, but a lower level of skin protection) receives $1.50 per hour above jourenyman.

Level C: (same as level B, but a lower level of respiratory protection) receives $1.00 per hour above journeyman.

OPERATING ENGINEER CLASSIFICATIONS:

GROUP 1: Asphalt Plant Engineer; Asphalt screed man; Apsco concrete spreader; Asphalt paver; Asphalt roller on bituminous contrete; Athey loaders; Cableways; Cherry Picker; ClamShell; C.M.I. & Similar Type Autograde Formless Paver,Autgrade Placer & Finisher; Concrete Breaker;Concrete plant Oper; Concrete Pumps; Cranes; Derricks;Derrick boats; Draglines; Earth auger boring machine, Elevating Graders; Engineers on dredge; Gravel processing machines;Head equipment greaser;High lift or fork lift;Hoist with two drums or 2 or more loadlines; Locomotive; Mechanics; Motor graders or auto patrols; Operators or levelman on dredges; Power boat oper; Pug mill oper; (Asphalt plat); Orange peels; Overhead cranes; Paving mixer; Piledrivers; Pipe wraper & Painting machines; Push dozers, or Push cats; Rock crusher; Ross carrier or similar machine; Scoops; Skimmers 2 cu yd capacity & Under: Sheep foot roller (self propelled);Shovels; Skimmer; Scoops; Test hole drilling machines; Tower machine; Tower mixer; Track Tupe & Loaders; Track type forklifts or high lifts; Track jacks & Tampers; Trackors; Sideboom; Trenching machine; Ditching machine; Tunnel lugger; Wheel type end loader; Winch cat; Scoops (Allor tournapull)

GROUP 2: Asphalt booster & Heater; Asphalt distributor; Asphalt plant fireman;Building Elevator; Bull float or flexplane; Concrete finshing machine; Concrete saw, self propelled; Concrete spreader machine; Gravel or stone spreader, Power operated; Hoist automatic; Hoist with one drum & one load line; Oiler on 2 paving mixers when used in tandem boom or winch truck; Ost hole diggers; Mechanical; Road or street sweeper, Self-propelled; Scissors hoist; Seaman tiller; Straw machine; Vibratory compactor; Well drill machine; & Mud jacks.

GROUP 3: Air compressor, Track or self-propelled; Bulk cement batching- plants; Conveyors; Concrete miers (Except Plant,Paver,Tower) Firement, Generators; Greasers; Light plants; Mechanical theater; Oilers; Power from graders; Power sub-grader; Pug mill, When used other than asphalt operation; Roolers (Except bitumin ous); Tractors w/o Power attachments regardless of size or type; Truck crane oiler; & driver (one man); Vibratory hammer; Water pump; Welding machine (one 300 amp or over) Combinations of five of any air compressors; Conveyors, Welding Machines, Water pumps; Light plants or Generators shall be in batteries or within 300 ft.

Group 4: Lattice Boom crawler crane, Lattice Boom truck

crane, Telescopic truck mounted crane, Tower crane

IRON0022-005 06/01/2025

CLARK, CLAY, COLES, CRAWFORD, CUMBERLAND, EDGAR, EFFINGHAM, IROQUOIS, JASPER, LAWRENCE, AND RICHLAND COUNTIES

	Rates	Fringes
IRONWORKER	$ 38.00	26.39

IRON0103-005 08/01/2024

CLAY (Louisville & South thereof), EDWARDS, FRANKLIN (Northeast corner), GALLATIN, HAMILTON, JEFFERSON (East of Mt. Vernon), LAWRENCE (Southern Half including Lawrenceville), MARION (Southeast), RICHLAND (Southern Half), SALINE (Northeastern 1/3), WABASH, WAYNE, and WHITE COUNTIES

	Rates	Fringes
IRONWORKER	$ 35.34	26.40

IRON0380-001 05/01/2024

CHAMPAIGN, DE WITT (Eastern Half), DOUGLAS, EDGAR, FORD, IROQUOIS, MOULTRIE, PIATT, and VERMILION COUNTIES

	Rates	Fringes
IRONWORKER	$ 37.71	29.65

IRON0392-005 08/01/2024

CLAY (Remainder), FAYETTE (Excludes St. Elmo and area North thereof), FRANKLIN (Northwest corner), JACKSON (Ana & Elksville TWPS), JEFFERSON (Mount Vernon & area West thereof), MARION (Remainder), and PERRY COUNTIES

	Rates	Fringes
IRONWORKER	$ 41.65	31.18

IRON0782-004 08/01/2025

ALEXANDER, FRANKLIN, HARDIN, JACKSON (Excludes Ava and Elkville TWPS), JOHNSON, MASSAC, POPE, PULASKI, SALINE (Excludes vicinity of El Dorado and are NE thereof), UNION, and WILLIAMSON COUNTIES

	Rates	Fringes
IRONWORKER	$ 37.66	32.10

LABO0159-001 05/01/2024

CLARK, COLES, CUMBERLAND, DOUGLAS, EDGAR, MOULTRIE (North), AND SHELBY COUNTIES

	Rates	Fringes
LABORER		
Asbestos Abatement Worker	$ 35.19	28.90
General Laborer	$ 32.19	28.90

LABO0159-007 05/01/2024

MOULTRIE COUNTY (South)

	Rates	Fringes
LABORER		
Asbestos Abatement Worker	$ 35.19	29.24
General Laborer	$ 32.19	29.24

LABO0477-008 05/01/2024

CHRISTIAN COUNTY

	Rates	Fringes
LABORER		
Asbestos Abatement Worker	$ 35.17	29.26
General Laborer	$ 32.17	29.26

LABO0703-001 05/01/2024

CHAMPAIGN, DE WITT, and PIATT COUNTIES

	Rates	Fringes
LABORER		
Asbestos Abatement Worker	$ 36.82	28.44
General Laborer	$ 33.82	28.44

LABO0703-007 05/01/2024

VERMILION COUNTY

	Rates	Fringes
LABORERS		
Asbestos Abatement Worker	$ 35.69	28.44
General Laborer	$ 32.69	28.44

LABO0751-001 06/01/2023

FORD and IROQUOIS COUNTIES

	Rates	Fringes
LABORER		
GROUP 1	$ 42.25	33.59
GROUP 2	$ 43.25	33.59

LABORER CLASSIFICATIONS

GROUP 1: General Laborer and Skilled Laborer - Handling of materials treated with oil, creosote, asphalt and/or foriegn material harmful to skin or clothing; Track Laborers; Cement Handlers; Chloride Handlers; Unloading and Laborers with Steel Workers and Re-bars; Concrete Workers (wet); Batch Dumpers; Mason Tenders; Kettle and Tar Men;

Tank Cleaners; Plastic Installers; Scaffold Workers; Motorized buggies or motorized unit used for wet concrete or handling of building materials; Laborers with de-watering systems; Sewer workers plus depth; Vibrator Operators; Motor Mixer Operators; Cement Silica, clay, fly ash, lime and plasters, handlers (bulk or bag); Cofferdam Workers plus depth; Concrete paving, placing, cutting and tying of reinforcing; Deck hand, dredge hand and shore laborers; Bankmen on floating plant; Asphalt Workers with machine and layers; Grade checker; Power Tools; Driving all stakes, stringlines for all machinery; Setting and building of manholes and catch basins; Stripping of all concrete forms except paving forms; All concrete paving and slope walls, placing, cutting and tying of reinforcing (re-bars and wire mesh); Caisson Workers plus depth; Gunnite Nozzle Men; Lead Man on Sewer Work; Welders, Cutters, Burners, & Torchmen; Chain Saw Operators; Paving Breaker, Jackhammer & Drill Operators; Layout Man and/or Tile Layer; Steel Form Setters (Street & Hwy); Air Tamping hammerman; Signalman on Crane; Concrete Saw Operator; Screenman on Asphalt Pavers; Front End Man on Chip Spreader; Laborers Tending Masons with hot materials or where foreign materials are used; Multiple Concrete duct-leadman; Luteman; Asphalt Raker; Curb Asphalt Machine Operator; Ready mix scalemen, permanent, portable or temporary plant; Laborers Handling Masterplate or similar materials; Laser Beam Operator; Coring Machine Operator; Plasterer Tenders; Underpinning and Shoring of Building; Material selector when working with firebrick or castable materials; Fire Watch; Signaling of all power equipment; Tree Topper or Trimmer; Tunnel Helpers in free air; Rod and Chainmen with Lead Surveyors, Surveyors, and Technical Engineers; Concrete Burning Machine Operator

GROUP 2: Asbestos Abatement Worker and Hazardous Waste Worker; Dynamite man; Lead Base Paint Abatement Worker

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LABO0773-003 04/01/2025

ALEXANDER, FRANKLIN, GALLATIN, HARDIN, JACKSON, JOHNSON, MASSAC, PERRY, POPE, PULASKI, SALINE, UNION, AND WILLIAMSON COUNTIES

	Rates	Fringes
LABORER		
Asbestos Abatement Worker	$ 37.15	27.99
General Laborer	$ 35.15	27.89

LABO1197-002 04/01/2025

CLAY, CRAWFORD, EDWARDS, EFFINGHAM, FAYETTE, HAMILTON. JASPER, JEFFERSON, LAWRENCE, MARION, RICHLAND, WABASH, WAYNE, AND WHITE COUNTIES

	Rates	Fringes
LABORER		
Asbestos Abatement Worker	$ 37.15	27.99
General Laborer	$ 35.15	27.89

MARB0054-001 05/01/2010

CLAY, EDWARDS, LAWRENCE, RICHLAND, WABASH, AND WAYNE COUNTIES

	Rates	Fringes
Marble, Tile & Terrazzo Workers	$ 29.60	13.33

PAIN0030-010 06/01/2023

BUREAU, FORD, HANCOCK, LA SALLE, LIVINGSTON, MCDONOUGH, MCLEAN, PUTNAM AND STARK COUNTIES

	Rates	Fringes
PAINTER Brush, Roller, Pressure Roller, Spray, Airless Spray, Sandblasting, Taper, Drywall Taper/Finisher, Structural Steel, and Bridges	$ 40.00	26.90

PAIN0032-004 09/01/2022

ALEXANDER, FRANKLIN, GALLATIN, HARDIN, JACKSON, JOHNSON, PERRY, POPE, PULASKI, SALINE, UNION, and WILLIAMSON COUNTIES

	Rates	Fringes
PAINTER	$ 31.37	20.02

Epoxy or Toxic-Lead-Based Paint Work-$1.00 Premimum

PAIN0058-004 05/01/2017

FAYETTE COUNTY

	Rates	Fringes
PAINTER	$ 31.25	17.12

Epoxy or Toxic-Lead-Based Paint Work-$1.00 Premimum

PAIN0090-001 09/01/2021

CHRISTIAN COUNTY

	Rates	Fringes
PAINTER	$ 32.23	20.58

Epoxy or Toxic-Lead-Based Paint Work-$1.00 Premimum

All work over 40 ft. above floor or ground level - $1.00 Premium

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PAIN0124-001 09/01/2021

CLAY, HAMILTON, JEFFERSON, MARION, and WAYNE COUNTIES

	Rates	Fringes

PAINTER
     Journeyman.....$ 26.50 19.01
     Taping (All Kinds).....$ 27.30 19.01

Epoxy or Toxic-Lead-Based Paint Work-$1.00 Premimum

PAIN0156-007 04/01/2023

EDWARDS, WABASH, AND WHITE COUNTIES

	Rates	Fringes
PAINTER		
Brush & Roller of Mastics, Creosotes, Kwinch Koate, and Coal Tar Epoxy	$ 28.30	20.08
Brush, Roller and Paperhanger	$ 27.30	20.08
Drywall Finishers and Plasterers	$ 27.55	20.08
Spray of Mastics, Creosotes, Kwinch Koate, and Coal Tar Epoxy	$ 29.55	20.08
Spray, Sandblast, Power Tools, Waterblast, and Steam Cleaning	$ 28.30	20.08

FOOTNOTE A:
All Structures over 40? $0.75/ hour above base wage
All Structures over 75? $1.50/ hour above base wage
All Structures over 100? $2.50/ hour above base wage

PAIN0157-009 05/01/2024

FORD AND IROQUIOS COUNTIES

	Rates	Fringes
GLAZIER	$ 39.74	27.78

PAIN0288-001 09/01/2021

DE WITT, MOULTRIE, PIATT, and SHELBY COUNTIES

	Rates	Fringes
PAINTER		
Brush and Roller	$ 30.50	22.30
Paperhanger and Drywall Taping	$ 30.50	22.30
Spray and Sandblasting	$ 31.25	22.30

Epoxy or Toxic-Lead-Based Paint Work-$1.00 Premimum

Work over 50 ft. above ground or floor level - $1.00 Premium

PAIN0363-001 05/01/2017

CHAMPAIGN, COLES, CUMBERLAND, DOUGLAS, and VERMILION COUNTIES

	Rates	Fringes

PAINTER.....$ 35.29 14.50

Epoxy or Toxic-Lead-Based Paint Work-$1.00 Premimum

PAIN0467-002 06/01/2024

IROQUOIS AND KANKAKEE COUNTIES

	Rates	Fringes
PAINTER Brush, Roller, Taper (Hand), Paperhanger, Swing Stage, Scaffold Over 30ft., Epoxy, Toxic Material, Sandblast, Spray, Machine Taping, and Residential Work Not to Exceed Two Families Per Structure	$ 41.00	27.80

PAIN0500-003 06/01/2024

MASSAC COUNTY

	Rates	Fringes
PAINTER	$ 24.50	15.50

Spray, sandblasting and water blast units with 3500 PSI receive $.50 per hour premimum. All work forty feet and above receive $1.00 per hour premimum.

PAIN0513-003 11/01/2023

BOND, CALHOUN, CLINTON, GREENE, JACKSON, JERSEY, MACOUPIN (Southside), MADISON, MARION, MONROE, PERRY, RANDOLPH, ST. CLAIR, AND WASHINGTON COUNTIES

	Rates	Fringes
GLAZIER	$ 43.32	25.43

PAIN1165-001 07/01/2025

CLARK, EDGAR, and VERMILION COUNTIES

	Rates	Fringes
GLAZIER	$ 36.03	20.65

PAIN1165-020 07/01/2024

ALEXANDER, CLAY, CRAWFORD, EDWARDS, FRANKLIN, GALLATIN, HAMILTON, HARDIN, JASPER, JEFFERSON, JOHNSON, LAWRENCE, MASSAC, POPE, PULASKI, RICHLAND, SALINE, UNION, WABASH, WAYNE, WHITE, and WILLIAMSON COUNTIES

	Rates	Fringes
GLAZIER	$ 32.86	19.44

PAIN1168-004 05/01/2024

CHAMPAIGN, CHRISTIAN, COLES, CUMBERLAND, DE WITT, DOUGLAS, EFFINGHAM, FAYETTE, MOULTRIE, PIATT, AND SHELBY COUNTIES

	Rates	Fringes
GLAZIER	$ 39.77	22.73

PAIN1705-001 09/01/2018

CLARK, CRAWFORD, EDGAR, EFFINGHAM, JASPER, LAWRENCE, and RICHLAND COUNTIES

	Rates	Fringes
PAINTER		
Blasting, Spraying & Pressure Washing	$ 28.37	21.05
Brush & Roller and Wall Covering Drywall Preparing	$ 27.37	21.05

Epoxy or Toxic-Lead-Based Paint Work-$1.00 Premimum

Brush & Roller work over 30' above ground or floor level - $0.80 Premium

Brush & Roller work over 100' above ground or floor level - $1.80 Premium

Blasting, Spraying & Pressure work over 30' above ground level - $2.30 Premium

Blasting, Spraying & Pressure work over 100' above ground level - $3.30 Premium

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PLAS0018-001 05/01/2023

CHRISTIAN COUNTY (Southern Half)

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 31.80	26.89
PLASTERER	$ 35.41	27.31

PLAS0018-022 05/01/2017

DE WITT COUNTY (Northern Half)

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 30.69	23.29

PLAS0103-001 05/01/2002

CHRISTIAN (North Part, South to a line running East and West established North of Humphrey including Stonington), DE WITT (Southern Half including Clinton), PIATT (Southern Part), and SHELBY (Excludes the towns of Cowden, Herrick, Lakewood, Moweaqua, Oconee, Shelbyville, Tower Hill, and Westervelt) COUNTY

	Rates	Fringes
Cement Mason/Plasterer	$ 22.50	9.75

PLAS0143-001 05/01/2018

CHAMPAIGN, CLARK, COLES, CRAWFORD, CUMBERLAND, DOUGLAS, EDGAR, EFFINGHAM, FORD, LAWRENCE, MOULTRIE, PIATT, VERMILION, AND WABASH COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 33.16	19.60
PLASTERER	$ 32.85	21.65

PLAS0143-013 04/01/2019

ALEXANDER, CLAY, CLINTON, EDWARDS, FAYETTE, FRANKLIN, GALLATIN, HAMILTON, HARDIN, JACKSON, JASPER, JEFFERSON, JOHNSON, MARION, MASSAC, PERRY, POPE, PULASKI, RANDOLPH, RICHLAND, SALINE, UNION, WASHINGTON, WAYNE, WHITE, and WILLIAMSON Counties

	Rates	Fringes
Cement Masons & Plasterers	$ 30.83	18.06

PLUM0130-003 06/01/2025

IROQUOIS COUNTY

	Rates	Fringes
PLUMBER	$ 55.40	38.27

PLUM0136-001 07/01/2025

EDWARDS, LAWRENCE, WABASH, and WHITE COUNTIES

	Rates	Fringes
Plumber, Pipefitter, Steamfitter	$ 46.32	21.43

PLUM0137-001 04/01/2025

CHRISTIAN COUNTY (West of a North and South line Running from the Western edge of Macon County)

	Rates	Fringes
PIPEFITTER/STEAMFITTER	$ 43.89	25.71

PLUM0137-008 04/01/2018

CHRISTIAN (East of a North and South line Running from the Western edge of Macon County), DE WITT, MOULTRIE, PIATT (Western Half), and SHELBY COUNTIES

	Rates	Fringes

Plumber and Steamfitter.....$ 37.96 18.87

PLUM0149-001 06/01/2025

CHAMPAIGN, COLES, CUMBERLAND, EFFINGHAM, FORD, JASPER, AND PIATT (east half) COUNTIES

	Rates	Fringes
Plumber and Steamfitter.....$	54.31	24.15

PLUM0157-003 07/01/2023

Clark, Crawford, Douglas, Edgar, Richland, and Vermilion Counties

	Rates	Fringes
PLUMBER, PIPEFITTER, STEAMFITTER.....$	40.95	20.50

PLUM0160-001 01/01/2025

ALEXANDER, HARDIN, JACKSON, JOHNSON, MASSAC, PERRY, POPE PULLASKI, UNION, AND WILLIAMSON (Southern Half) COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER.....$	50.80	22.95

PLUM0551-001 01/01/2025

FRANKLIN, GALLATIN, HAMILTION, JEFFERSON, SALINE, WAYNE, AND WILLIAMSON (Northern Half) COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER.....$	45.75	28.10

PLUM0597-005 06/01/2023

IROQUOIS COUNTY

	Rates	Fringes
PIPEFITTER.....$	55.00	38.62

PLUM0653-001 09/01/2025

CLAY, FAYETTE, and MARION COUNTIES

	Rates	Fringes
Plumber, Pipefitter, Steamfitter.....$	45.00	21.54

ROOF0002-006 06/01/2025

ALEXANDER, FRANKLIN, HAMILTON, JACKSON, JEFFERSON, JOHNSON, MARION, PERRY, POPE, PULASKI, SALINE, UNION, WAYNE, and WILLIAMSON COUNTIES

	Rates	Fringes
ROOFER	$ 32.85	17.86

ROOF0097-001 06/01/2024

CHAMPAIGN, CLARK, COLES, CUMBERLAND, DOUGLAS, EDGAR, FORD (South of Piper City), PIATT (EAST SECTION OF PIATT, WEST OF & EXCLUDING THE CITIES OF MONTICELLO & LODGE), and VERMILION COUNTIES

	Rates	Fringes
ROOFER	$ 38.00	22.17

ROOF0097-003 06/01/2025

CHRISTIAN (Eastern Half), CLAY, DE WITT (Southern Half), EFFINGHAM, FAYETTE, JASPER, MOULTRIE, PIATT (Western Half), RICHLAND, AND SHELBY COUNTIES

	Rates	Fringes
ROOFER	$ 35.07	27.41

ROOF0106-004 04/01/2025

MASSAC COUNTY

	Rates	Fringes
ROOFER		
Composition Roofer	$ 36.12	20.01
Slate, Tile, Concrete, Slab, and Gypsum Plank	$ 36.62	20.01

ROOF0106-005 04/01/2025

EDWARDS, GALLATIN, HARDIN, WHITE AND WABASH COUNTIES

	Rates	Fringes
ROOFER		
Composition Roofer	$ 36.12	20.01
Slate, Tile, Concrete, Slab, and Gypsum Plank	$ 36.62	20.01

ROOF0112-003 06/01/2025

CHRISTIAN COUNTY (Bolivia, Breckenridge, Buckhart, Bulpitt, Callaway, Clarksville, Edinburgh, Grove City, Harvel, Hewittsville, Humphrey. Jeisyville, Kincaid, Langlyville, Morrisonville, Palmer, Roby, Sharpsbury, Taylorville, Tovey, Vanderville, and Zenobia)

	Rates	Fringes
ROOFER	$ 36.00	26.36

ROOF0150-001 07/01/2025

CRAWFORD and LAWRENCE COUNTIES

	Rates	Fringes
ROOFER	$ 30.50	18.26

SHEE0020-005 07/03/2017

CLARK, CRAWFORD, EDGAR & LAWRENCE COUNTIES

	Rates	Fringes
Sheet metal worker	$ 33.50	20.45

SHEE0218-004 06/01/2023

CHAMPAIGN, COLES, CUMBERLAND, DOUGLAS, FORD, MOULTRIE, PIATT, SHELBY & VERMILION COUNTIES

	Rates	Fringes
SHEET METAL WORKER	$ 42.73	29.54

SHEE0265-002 06/01/2024

IROQUOIS COUNTY

	Rates	Fringes
SHEET METAL WORKER	$ 56.35	38.65

SHEE0268-003 07/01/2025

ALEXANDER, CLAY, EDWARDS, EFFINGHAM, FAYETTE, FRANKLIN, GALLATIN, HAMILTON, HARDIN, JACKSON, JASPER, JEFFERSON, JOHNSON, MARION, MASSAC, PERRY, POPE, PULASKI, RICHLAND, SALINE, UNION, WABASH, WAYNE, WHITE, and WILLIAMSON COUNTIES

	Rates	Fringes
Sheet metal worker	$ 46.57	24.48

TEAM0026-002 05/01/2025

CHAMPAIGN, COLES, CUMBERLAND, DEWITT, DOUGLAS, EFFINGHAM, FORD (Southern Section - Elliot, Gibson City, Harpster, Melvin, Paxton, Roberts & Sibley), IROQUOIS (Fountain Creek, Lovejoy, Milford, Pigeon Grove, Prairie Green & Stockland), JASPER, MOULTRIE (East of a line from the Northeast corner of the county extending Southeast in the direction of Findlay (Shelby County) to a point that intersects the Shelby County line), PIATT (East of a line from where the DeWitt County line intersects Route 10 in a Southeast direction towards the Southeast corner of the county), SHELBY (East of an imaginary line beginning at the Northeast border with Moultrie County extending Southwest in the direction of Findlay and continuing to an imaginary point 2.5 miles South of Middlesworth that parallels the Cumberland County line), AND VERMILION COUNTIES

	Rates	Fringes

TRUCK DRIVER

Group 1	$ 45.29	25.42
Group 2	$ 45.88	25.42
Group 3	$ 46.15	25.42
Group 4	$ 46.54	25.42
Group 5	$ 47.64	25.42

CLASSIFICATIONS:

GROUP 1: Drivers on 2 axles hauling less than 9 tons; air compressor & welding machines and brooms, including those pulled by separate units; Truck Driver Helper, warehouse employees; Mechanic Helpers; greasers and tiremen; pick-up trucks when hauling material, tools, or workers to and from and on the job site; and forklifts up to 6,000 lb capacity.

GROUP 2: 2 or 3 axles hualing more than 9 tons but hauling less than 16 tons; A-frame winch trucks; hydrolift trucks; Vactor Trucks or similar equipment when used for transportation purposes; Forklift over 6,000 lb.capacity; winch trucks; and four axle combiation units.

GROUP 3: 2, 3 or 4 Axles hauling 16 tons or more; 5-Axles or more combination units; drivers on water pulls; articulated dump trucks; mechanics and working forepersons.

GROUP 4: Low Boy and Oil Distributors.

GROUP 5: Drivers who require special protective clothing while employed on hazardous waste work.

TEAM0050-002 05/01/2025

ALEXANDER, CLAY, FAYETTE, FRANKLIN, HAMILTON, HARDIC, JACKSON, JEFFERSON, JOHNSON, MARION, MASSAC, PERRY, POPE, PULASKI, SALINE, UNION, WAYNE, WHITE, WILLIAMSON COUNTIES

	Rates	Fringes
TRUCK DRIVER		
Group 1	$ 45.35	25.72
Group 2	$ 45.93	25.72
Group 3	$ 46.25	25.72
Group 4	$ 46.60	25.72
Group 5	$ 47.71	25.72

CLASSIFICATIONS:

GROUP 1: Drivers on 2 axles hauling less than 9 tons; air compressor & welding machines and brooms, including those pulled by separate units; Truck Driver Helper, warehouse employees; Mechanic Helpers; greasers and tiremen; pick-up trucks when hauling material, tools, or workers to and from and on the job site; and forklifts up to 6,000 lb capacity.

GROUP 2: 2 or 3 axles hualing more than 9 tons but hauling less than 16 tons; A-frame winch trucks; hydrolift trucks; Vactor Trucks or similar equipment when used for transportation purposes; Forklift over 6,000 lb.capacity; winch trucks; and four axle combiation units.

GROUP 3: 2, 3 or 4 Axles hauling 16 tons or more; 5-Axles or more combination units; drivers on water pulls; articulated

dump trucks; mechanics and working forepersons.

GROUP 4: Low Boy and Oil Distributors.

GROUP 5: Drivers who require special protective clothing while employed on hazardous waste work.

TEAM0135-007 05/01/2025

CLARK, CRAWFORD, EDGAR, EDWARDS, LAWRENCE, RICHLAND, and WABASH COUNTIES

	Rates	Fringes
TRUCK DRIVER		
Group 1	$ 38.55	16.11+a
Group 2	$ 38.97	16.11+a
Group 3	$ 39.18	16.11+a
Group 4	$ 39.44	16.11+a
Group 5	$ 39.44	16.11+a

FOOTNOTE: a. $46.20 per day

CLASSIFICATIONS:

Group 1 - Drivers on 2 axle truckshauling less than 9 ton; Air compressor and welding machines and brooms, including those pulled by separate units; Truck Driver Helpers; Warehouse employees; Mechanic helpers; Greasers and tiremen; fork lifts up to 6,000 pounds capacity

Group 2 - 2 or 3 axle trucks hauling more than 9 ton but hauling less than 16 ton; A-frame winch trucks; Hydrolift trucks; Vactor trucks or similar equipment when used for transportation purposes; Fork lifts over 6,000 pound capacity; Winch trucks; 4 axle combination units; In the event the Employer desires to use ticket writers that classification shall come under Group II

Group 3 - 2, 3, or 4 axle trucks hauling 16 ton or more; Drivers on water pulls; Articulated Dump Trucks; Mechanics and working forepersons; 5 axle or more combination units

Group 4 - Low Boy; Oil Distributors

Group 5 - Drivers who require special protective clothing while employed on hazardous waste work.

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* TEAM0179-010 06/01/2024

IROQUOIS COUNTY (All except the townships of Milford, Stockland, Loda, Pigeon Grove, Fountain Creek, Lovejoy, and Prairie Green)

	Rates	Fringes
TRUCK DRIVER		
2 or 3 axles	$ 44.82	0.25+a
4 axles	$ 44.97	0.25+a
5 axles	$ 45.17	0.25+a
6 axles	$ 45.37	0.25+a

FOOTNOTES:
a. $1055.60 per week.
  Low Boy work classification is an additional $1.50 per hour
  An additional $.20 per axle shall be paid for all vehicles with more than six (6) axles.

CLASSIFICATIONS:

  Group 1 - Frame Truck when used for transportation purposes; Air Compressor and Welding Machines, including those pulled by cars, pick-up trucks and tractors; Ambulances; Articulated Dumps; Batch Gate Lockers; Batch Hopperman; Car and Truck Washers; Carry Alls; Forl Lifts and Hoisters; Helpers; Mechanics Helpers and Greasers; Oil Distributors, two-man operation; Pavement Breakers; Pole Trailer, up to 40 feet; Pothole Repair Trucks; Power Mower Tractors; Quick Change Barrier; Self-Propelled Chip Spreader; Shipping and Receiving Clerks and Checkers; Skipman; Slurry Trucks, two-man operation; Slurry Trucks, Conveyor Operated - 2 or 3 man operation; Teamsters; Unskilled Dumpmen; Warehousemen and Dockmen; Truck Drivers hauling warning lights, barricades, and portable toilets on the job site

  Group 2 - Dispatcher; Dump Crets and Adgetators under 7 yards; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnapulls or Turnatrailers when pulling other than self-loading equipment or similar equipment under 16 cubic yards; Mixer Trucks under 7 yards; Ready-Mix Plant Hopper Operator; Winch Trucks, 2 Axles

  Group 3 - Dump Crets and Adgetators, 7 yards and over; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnapulls or Turnatrailers when pulling other than self-loading equipment or similar equipment over 16 cubic yards; Explosives and/or Fission Material Trucks; Mixer Trucks 7 yards or over; Mobile Cranes while in transit; Oil Distributors, one-man operation; Pole Trailer, over 40 feet; Pole and Expandable Trailers hauling material over 50 feet long;
  Slurry Trucks, one-man operation; Winch Trucks, 3 axles or more; Mechanic - *Truck Welder and *Truck Painter*These classifications shall only apply in areas where and when it has been a past area practice; Asphalt Plant Operators in areas where it has been past practice

  Group 4 - Dual-purpose vehicels, such as mounted crane tucks with hoist and accessories; Foreman; Master Mechanic; Self-loading equipment like P.B. and trucks with scoops on the front

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* TEAM0179-013 06/01/2024

FORD COUNTY (North section the of the County North of a line from the Southeastern corner of Livingston County straight East to the Ford-Irquois County Line)

	Rates	Fringes
TRUCK DRIVER		
2 or 3 Axle Trucks	$ 44.82	0.25+a
4 Axle Trucks	$ 44.97	0.25+a

5 Axle Trucks	$ 45.17	0.25+a
6 Axle Trucks	$ 45.37	0.25+a

FOOTNOTES:
a. $1055.60 per week.

Low-Boy work classification is an additional $1.50 per hour

An additional $.20 per axle shall be paid for all vehicles with more than six (6) axles.

CLASSIFICATIONS:

Group 1 - Frame Truck when used for transportation purposes; Air Compressor and Welding Machines, including those pulled by cars, pick-up trucks and tractors; Ambulances; Articulated Dumps; Batch Gate Lockers; Batch Hopperman; Car and Truck Washers; Carry Alls; Forl Lifts and Hoisters; Helpers; Mechanics Helpers and Greasers; Oil Distributors, two-man operation; Pavement Breakers; Pole Trailer, up to 40 feet; Pothole Repair Trucks; Power Mower Tractors; Quick Change Barrier; Self-Propelled Chip Spreader; Shipping and Receiving Clerks and Checkers; Skipman; Slurry Trucks, two-man operation; Slurry Trucks, Conveyor Operated - 2 or 3 man operation; Teamsters; Unskilled Dumpmen; Warehousemen and Dockmen; Truck Drivers hauling warning lights, barricades, and portable toilets on the job site

Group 2 - Dispatcher; Dump Crets and Adgetators under 7 yards; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnapulls or Turnatrailers when pulling other than self-loading equipment or similar equipment under 16 cubic yards; Mixer Trucks under 7 yards; Ready-Mix Plant Hopper Operator; Winch Trucks, 2 Axles

Group 3 - Dump Crets and Adgetators, 7 yards and over; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnapulls or Turnatrailers when pulling other than self-loading equipment or similar equipment over 16 cubic yards; Explosives and/or Fission Material Trucks; Mixer Trucks 7 yards or over; Mobile Cranes while in transit; Oil Distributors, one-man operation; Pole Trailer, over 40 feet; Pole and Expandable Trailers hauling material over 50 feet long;
Slurry Trucks, one-man operation; Winch Trucks, 3 axles or more; Mechanic - *Truck Welder and *Truck Painter*These classifications shall only apply in areas where and when it has been a past area practice; Asphalt Plant Operators in areas where it has been past practice

Group 4 - Dual-purpose vehicels, such as mounted crane tucks with hoist and accessories; Foreman; Master Mechanic; Self-loading equipment like P.B. and trucks with scoops on the front

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TEAM0279-002 05/01/2025

CHRISTIAN, MOULTRIE (West of a line from the NE Corner, extending straight SE in the direction of Findlay (Shelby County) to a point that intersects the Shelby county line), PIATT (West of a line from where the DeWitt County line intersects Route 10, in a SE direction toward the SE border of the county), SHELBY (West of an imaginary line beginning at the

NE border with Moultrie County, extending SW in the direction
of Findlay, and continuing to the same point (2.5 miles) South
of Middlesworth, then towards the NE cordner of Fayette County)
COUNTIES

	Rates	Fringes
TRUCK DRIVER		
Group 1	$ 43.28	27.56
Group 2	$ 43.86	27.56
Group 3	$ 44.15	27.56
Group 4	$ 44.53	27.56
Group 5	$ 45.61	27.56

CLASSIFICATIONS:

GROUP 1: Drivers on 2 axles hauling less than 9 tons; air compressor & welding machines and brooms, including those pulled by separate units; Truck Driver Helper, warehouse employees; Mechanic Helpers; greasers and tiremen; pick-up trucks when hauling material, tools, or workers to and from and on the job site; and forklifts up to 6,000 lb capacity.

GROUP 2: 2 or 3 axles hualing more than 9 tons but hauling less than 16 tons; A-frame winch trucks; hydrolift trucks; Vactor Trucks or similar equipment when used for transportation purposes; Forklift over 6,000 lb.capacity; winch trucks; and four axle combiation units.

GROUP 3: 2, 3 or 4 Axles hauling 16 tons or more; 5-Axles or more combination units; drivers on water pulls; articulated dump trucks; mechanics and working forepersons.

GROUP 4: Low Boy and Oil Distributors.

GROUP 5: Drivers who require special protective clothing while employed on hazardous waste work.

TEAM0347-001 05/01/2025

GALLATIN COUNTY

	Rates	Fringes
TRUCK DRIVER		
Group 1	$ 43.28	27.56
Group 2	$ 43.86	27.56
Group 3	$ 44.15	27.56
Group 4	$ 44.53	27.56
Group 5	$ 45.61	27.56

CLASSIFICATIONS:

GROUP 1: Drivers on 2 axles hauling less than 9 tons; air compressor & welding machines and brooms, including those pulled by separate units; Truck Driver Helper, warehouse employees; Mechanic Helpers; greasers and tiremen; pick-up trucks when hauling material, tools, or workers to and from and on the job site; and forklifts up to 6,000 lb capacity.

GROUP 2: 2 or 3 axles hualing more than 9 tons but hauling less than 16 tons; A-frame winch trucks; hydrolift trucks; Vactor Trucks or similar equipment when used for

transportation purposes; Forklift over 6,000 lb.capacity; winch trucks; and four axle combiation units.

GROUP 3: 2, 3 or 4 Axles hauling 16 tons or more; 5-Axles or more combination units; drivers on water pulls; articulated dump trucks; mechanics and working forepersons.

GROUP 4: Low Boy and Oil Distributors.

GROUP 5: Drivers who require special protective clothing while employed on hazardous waste work.

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next

number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION"

EXHIBIT A - GEOTECHNICAL REPORT

SUBSURFACE EXPLORATION AND FOUNDATION RECOMMENDATIONS PROPOSED WATER TREATMENT FACILITY ROBINSON, ILLINOIS

Farnsworth Group
400 West Jefferson, Suite A
Effingham, Illinois 62401

Prepared by:

HFE
Holcomb Foundation Engineering
Carbondale, Illinois
618-529-5262

March 1, 2022

File H-21257

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SUBSURFACE EXPLORATION AND FOUNDATION RECOMMENDATIONS

PROPOSED WATER TREATMENT FACILITY ROBINSON, ILLINOIS

1.0 Introduction

The Farnsworth Group is designing a new water treatment plant east of Robinson, Illinois. This report provides a summary of the subsurface exploration and engineering recommendations for foundation design of the proposed new facility. The Robinson Palestine Water Commission authorized this project on November 19, 2021.

2.0 Scope and Purpose of Report

The purpose of this geotechnical exploration is to explore subsurface conditions at the specific locations of eighteen soil borings, conduct field and laboratory tests to gather data necessary to perform an evaluation of the subsurface conditions, and prepare engineering recommendations relative to the following items:

- Subsurface conditions encountered in the soil borings, including material types to be expected at existing grades and their impact on the construction scheme.
- Site preparation considerations relative to the subsurface conditions.
- Foundation support for the proposed water treatment structures, including acceptable bearing pressures, anticipated bearing levels, and settlement estimates.
- Floor slab support and construction.
- Anticipation and management of ground water during construction.
- Soil material and compaction requirements for support of the proposed structures.
- Seismic design recommendations for design of the treatment structures.

- Lateral soil pressures acting on the proposed subsurface walls.

- Presence of mining activity as indicated on the Illinois State Geological Survey underground mine maps.

3.0 Site Description

This site is located on the east side of Illinois State Route #1, north of the intersection of Routes #1 and #33, east of Robinson, Illinois. The site was an open grassy field at the time of our field exploration. Ground line elevations range from about 477 to 480 at this site. The enclosed Boring Location Diagram indicates the borehole locations in relation to the proposed structures.

4.0 Project Description

The new water treatment facility will consist of the following structures:

Boring No.	Structure
1-4	Masonry/PEMB Building
5-10	Water Filter
11	Concrete Water Storage Structure
12-17	Ground Storage Tanks

The masonry or PEMB building will be a single story structure with relatively light structural loadings. This is primarily an office building, with truck bays on the north side of the building.

The water filter building is to be a masonry structure with spread footings. This will house a 15 foot tall tank filled with water, and deep pumps that will be 12 to 15 feet deep.

The concrete structure at Boring #11 is to be a 20 foot tall structure filled with water, approximately 30 by 30 feet in plan dimensions.

The ground storage tanks will have a diameter of 65 feet, with a height of 40 feet.

The configuration of these structures may change based upon the soil borings and additional revisions to the design.

5.0 Field Exploration

From December 9 to 13, 2021, we drilled seventeen soil borings at this site. Boring locations were staked by The Farnsworth Group prior to our arrival on site. We returned to this site on February 14, 2022, to obtain Shelby tube samples of the upper soils in the vicinity of the proposed ground storage tanks for a consolidation test at Boring #13A.

5.1 Drilling and Sampling Procedures

The soil borings were drilled with a CME 750 all-terrain drill rig. Conventional 3.25 inch inside diameter hollow stem augers were used to advance the boreholes. Representative soil samples were obtained on 2.5- and 5.0-foot intervals employing split barrel sampling procedures in accordance with ASTM D-1586 and Shelby tube sampling per ASTM D-1587. Upon completion of drilling, the boreholes were backfilled with the soil cuttings.

5.2 Field Tests and Measurements

The following field tests and measurements were performed during the course of exploration activities at the site:

- Ground water readings were obtained during and upon completion of drilling at all soil boring locations.
- Standard penetration tests were performed and penetration resistances recorded during the recovery of all split barrel samples.
- Approximate measurements of undrained shear strength were taken on all cohesive soil samples with a calibrated hand penetrometer.
- All samples were visually classified, according to the Unified Classification System, by the boring technician in preparation of the field boring logs. The samples were then placed into glass jars for transport to our laboratory.

The field test data and measurements are summarized in the Boring Logs located in the appendix to this report.

6.0 Laboratory Tests

In addition to the field exploration, a laboratory-testing program was conducted to determine additional engineering characteristics of the foundation subsoils. All tests were performed in accordance with applicable ASTM specifications. The laboratory-testing program included the following tests:

6.1 Natural Moisture Content

Natural moisture content determinations were performed on all samples. Moisture content determinations aid in estimating the settlement potential of a soil strata. The in-situ moistures also yield information as to the workability of a soil type. Moisture content results are graphically presented on the Boring Logs.

6.2 Visual Classifications

All soil samples were visually classified by the geotechnical engineer in accordance with the Unified Classification System. The visual classifications are noted on the Boring Logs.

6.3 Unconfined Compressive Strengths

Cohesive soil samples were subjected to unconfined compressive strength tests. Unconfined compressive strengths are used to determine the undrained shear strength of a soil. Results of the compressive strength tests are plotted on the Boring Logs.

6.4 Consolidation Test

A consolidation test was performed on the upper softer soils encountered in the vicinity of the proposed ground storage tanks. The consolidation test is used to estimate settlements and the time required to achieve most of the settlement after the soils are subjected to additional loadings.

6.5 Sample Disposal

The soil samples are stored in our laboratory for further analysis, if desired. Unless notified to the contrary, the samples will be disposed of six months after the date of this report.

7.0 Subsurface Conditions

The types of subsurface materials encountered in the soil borings are briefly described on the Boring Logs in the appendix to this report. The general characteristics are described in the following paragraphs. The conditions represented by these test borings should be considered applicable only at the test boring locations on the dates shown. It is possible the conditions encountered may be different at other locations or at other times.

7.1 General Subsurface Profile

The subsurface profile at this site consists of seven to eight inches of topsoil overlying ten to eighteen feet of brown mottled gray silty clay (CL classification), sandy clay (CL) and clayey silt (ML). Below the upper silty clay and sandy clay lies brown to gray silty clay (CL) with sand and gravel that extends down to at least the bottom of the deeper soil borings.

7.2 Topsoil

The topsoil is a highly organic stratum. Upon decay of the organic material in this stratum, the topsoil will become highly compressible. The topsoil is not suitable for support of the proposed footings, slabs, or structural fills at this site.

7.3 Silty Clay and Sandy Clay

The upper ten to eighteen feet of silty clay to sandy clay is variable in strength. Between about 5 to 12 feet lies a softer stratum, with the soils above and below these depths being firm to stiff. The firm to stiff soils have unconfined compressive strengths of 0.6 to 2.6 tons per square foot, averaging 1.2 tsf. Standard penetration test values of 3 to 12 blows per foot were encountered in these soils, averaging 6 bpf. Moisture contents of 13 to 32 percent were encountered.

The softer soils between about 5 to 12 feet have unconfined compressive strengths of 0.2 to 0.9 tons per square foot, averaging 0.5 tsf. Standard penetration test values vary from 3 to 7 blows per foot. Moisture contents vary from 17 to 30 percent, averaging 22 percent. The softer soils have a relatively high settlement potential.

7.4 Silty Clay with Sand and Gravel

The silty clay with sand and gravel has unconfined compressive strengths of 1.2 to 6.2 tons per square foot, averaging 4.1 tsf. Standard penetration test values vary from 6 to in excess of 100 blows per foot, averaging 56 bpf. Moisture contents of 6 to 22 percent were encountered in these soils, averaging 10 percent. This is a glacial till deposit, and has a relatively low settlement potential.

7.5 Ground Water

Ground water was encountered at the following depths during and upon completion of drilling operations in the borings:

	Ground Water Encountered	
Boring No.	During Drilling (ft.)	Upon Completion (ft.)
4	13.5	6.0 (Plug)
5	11.0	10.0
6	Dry	10.0
7	Dry	10.0
8	Dry	10.0
9	Dry	10.0
10	13.5	10.0
11	Dry	8.0
12	18.5	17.5
13	Dry	32.0
14	13.5	11.0
15	15.0	10.0
16	15.0	11.0
17	15.0	10.0

The remaining soil borings were dry during and upon completion of drilling operations.

7.6 Undermining

Mine maps available from the Illinois State Geological Survey indicate this site has not been undermined. Therefore, subsidence is not a concern at this location.

8.0 Grading Considerations

8.1 Site Preparation

Prior to construction, the topsoil should be stripped from the location of the proposed structures to be built at or above grade. The topsoil should be wasted or used to grade landscaped areas of this site.

Due to the high silt content of the upper soils at this site, we highly recommend the site grading operations are performed during hot, dry seasons of the year. The silty clay will tend to pump and rut when wet, resulting in possible removal and replacement with loss of stability.

Upon stripping the topsoil, it is recommended the exposed subgrade in areas to support any above-ground structures is proofrolled. During proofrolling operations, isolated areas that pump or rut should either be disced and aerated, or excavated from the site and replaced. Upon drying any pumping soils encountered, they should be compacted to a minimum of 95% of the maximum standard laboratory dry density as determined by ASTM Method of Test D-698.

8.2 Fill Placement

After stripping topsoil and proofrolling the subgrade, fill soils may be placed to grade any roads and structures that are at or near the existing grade. The low-plastic silty clay soils encountered at this site in areas to be excavated for the subsurface structures will provide acceptable fill material after they are processed to lower their moisture content. It is recommended the fill soils be placed in maximum eight-inch loose lifts, with each lift compacted to a minimum of 98% of the maximum standard laboratory dry density below any structural footings, and 95% compaction in the parking lots and above the foundations. The fill material should be placed within three percent of its optimum moisture content.

A sufficient number of in-place field density tests should be performed by an engineering technician to evaluate the contractor's performance during fill soil placement and compaction. The tests will also aid in determining whether project specifications are being met. A minimum of four compaction tests per every lift are recommended, with not less than one test per 5,000 square feet of fill material.

8.3. Subsurface Excavations

The clayey subsoils encountered in the borings will require shoring and bracing of the excavations or overexcavation on a slope will be required for worker's safety. Based upon the soil borings, the subsurface profile at this site may be classified as a Type B per the Department of Labor 29 CFR Part 1926 OSHA Excavation Rules.

It should be noted the following depths in the soil borings are where softer soils were encountered in the borings that may affect the stability of the excavations:

Boring No.	Approximate Depth (ft.)
5	8-11'
6	3-10'
8	3-10'
10	8-11'

These soils may require overexcavation on a slope, benching, or sheet piling to achieve stability of the sidewalls.

8.4 Subgrade Preparation of Floor Slabs

Environmental conditions and construction traffic often disturb even a well-prepared soil surface at the final grade elevation. Provisions should be made in the construction specifications for the contractor to restore the subgrade soils to a stable condition prior to placing the granular mat. Backfilling of utility trenches is often accomplished in an uncontrolled manner, leading to cracking of floor slabs and pavements. We recommend the utility trenches are backfilled with acceptable fill in eight-inch loose lifts and compacted with piston tampers to the project requirements.

The concrete floor slabs may be supported upon a four-inch layer of free draining granular material. Generally, Illinois Department of Transportation Type "A" CA-7 or CA-11 crushed limestone is used in Southern Illinois for this purpose. This is to provide a capillary break and a uniform leveling course beneath the slab.

8.5 Ground Water Control

Footing excavations for structures near the existing ground line should not experience ground water problems. However, the deeper excavations may encounter ground water during construction of the subsurface structures.

Should ground water be encountered in deeper excavations, it may be removed using sumps and/or interceptor ditches. It does not appear the excavations will require well points or sheet piling due to the clayey soils encountered in the soil borings.

9.0 Engineering Recommendations

9.1 Building Structure Foundations

The structural foundations for the proposed waste water treatment plant may be supported upon isolated spread footings or mat foundations dimensioned using the following net allowable soil bearing pressures:

Structure	Depth (ft)	Net Allowable Soil Bearing Pressure (PSF)
Masonry/PEMB Building	3.0	1500
Water Filter	3-15	1500
Concrete Structure	3.0	1500

It is recommended the bottom of all footing excavations are probed with a calibrated penetrometer prior to placement of concrete. If soft or unsuitable subsoils are encountered, it should be excavated and replaced with a well compacted CA-6 crushed stone, flowable fill material, or lean concrete.

Settlements of footings founded on the clayey subsoils at about three feet in depth are estimated as follows:

Structure	Estimated Settlement (in.)
Masonry/PEMB Building*	1-2"
Water Filter	1-2"
Concrete Structure	2-3"

* - assuming a column load of 50 kips.

Although some of the settlement (25-50%) is estimated to occur during construction, if the settlements appear excessive, these structures may be surcharged with soil prior to construction as discussed in Section 9.2 of this report.

It is recommended all footings at this site have a minimum width of 24 inches to avoid a punching type failure of the foundation. A minimum depth of 36 inches for any shallow footings is recommended for frost protection.

9.2 Tank Foundations

The water storage tanks to be constructed in the vicinity of Borings #12 to #18 are to have diameters of 65 feet with heights of 40 feet. This will result in a unit loading of approximately 2500 pounds per square feet. Due to the softer subsoils encountered in the soil borings above about 15 feet in depth, it is recommended the subsoils below the tanks are surcharged with soil approximately equal to the weight of the tanks when loaded. Assuming a tank loading of 2500 pounds per square foot, with a soil weight of 125 pounds per square foot, the surcharge loading required is approximately 20 feet high. Based on the consolidation test, settlements of the soil when loaded with the surcharge are estimated to range from about 5 to 7 inches.

Prior to placing the surcharge loading, it is recommended two settlement plates are installed at each tank area. The plates can be monitored for settlement and should indicate when the surcharge can be removed. Based upon the consolidation test, it is estimated that approximately 50% of the estimated settlement will occur in about 18 days, and 90% of the settlement in 77 days.

9.3 Seismic Design

Based upon the seismic design criteria provided by the AWWA, this site has a site classification type "C" profile. Based upon this profile, the spectral response acceleration coefficients have been determined as follows:

0.2 Second Period: S_{ms} = 0.414 g x 1.2 (Soil Factor F_a) = 0.497

1.0 Second Period: S_{m1} = 0.144 g x 1.656 (Soil Factor F_v) = 0.238

The recommended design spectral response factors are as follows:

S_{DS} = 0.331 g S_{D1} = 0.158 g

These values were obtained from the AWWA Publication D100-21.

9.4 Subsurface and Retaining Wall Design

Coefficients for active and passive pressures acting upon subsurface and retaining walls in the clayey soils on this site are estimated as follows:

Coefficient of Active Pressure:	0.36
Coefficient of Passive Pressure:	2.77
Coefficient of At-Rest Pressure:	0.53

The silty to clayey subsoils encountered on this site have a wet soil density of approximately 125 pounds per cubic foot.

It is recommended the subsurface walls are backfilled with free draining sand or crushed stone up to within one foot of the final ground line, with perforated PVC pipe at the base allowed to gravity drain or drain to a sump.

The recommended coefficient of friction between the concrete and soils which may be used for design is 0.33.

9.5 Floor Slab Design

The proposed concrete slabs on grade may be designed using a modulus of subgrade reaction estimated at approximately 100 psi per inch. The soil subgrade beneath the upper floor slabs should be properly proofrolled or compacted per the recommendations in Section 8 of this report.

9.6 Hydrostatic Resistance

The structures below ten feet in depth at this site should be designed to allow for drainage of the subsoils from below the floor slab and around the subsurface walls with perforated drain pipe. The drainage pipes should be installed below the floor slab and around subsurface walls draining to a sump or allowed to gravity drain. The pipes should be backfilled with a clean crushed limestone, wrapped with filter fabric.

If the structures cannot be drained, anchors or pressure relief valves should be installed to keep the structures from floating out of the ground at this site.

10.0 Summary

This subsurface exploration has been conducted at the site of a proposed water treatment facility in Robinson, Illinois. This report has been prepared for the exclusive use of The Farnsworth Group for the specific application to this project.

Design and construction criteria have been suggested and potential problems have been discussed.

The following information has been discussed in this report:

- Soils encountered on the site consist of a thin mantle of topsoil overlying ten to eighteen feet of firm to soft brown mottled gray silty clay, sandy clay and clayey silt. Below the upper silty clay and sandy clay lies stiff brown to gray silty clay with sand and gravel that extends down to at least the bottom of the deeper soil borings.

- Site grading will include stripping topsoil, proofroll of the exposed subgrade, undercut of soft subsoils, and placement of fill in areas to support shallow structures.

- Deep structures will require bracing or overdig for workers safety. It does not appear excessive shoring or sloping of the excavations will be necessary in areas outside the softer locations noted in Section 8.3 of this report.

- Foundation design criteria have been discussed, and allowable soil bearing pressures have been recommended for spread footing and mat foundations.

- The spread footings or mat foundations may be dimensioned using maximum allowable net soil bearing pressures of 1500 to 2500 pounds per square foot, depending on the type of structure.

- Due to the softer upper soils, settlements below the structures are estimated to range from about 1-2 inches for lightly loaded structures to 5-7 inches below the water storage tanks. To reduce the estimated settlements, the areas that will support structures may be preloaded with soil equivalent to the weight of the structures. Settlement plates should be installed below the surcharge fill, and monitored to determine when the primary settlements have occurred. After most of the settlement has occurred, the surcharge may be removed and the structures constructed.

- The AWWA Earthquake design criteria indicate the recommended design spectral response factors are S_{DS} = 0.331 g and S_{D1} = 0.158 g.

- Coefficients of horizontal earth pressures have been presented for the subsurface structural and retaining wall designs.

The analyses, conclusions, and recommendations contained in this report are professional opinions based on the site conditions and project scope described herein. It is assumed the conditions observed in the exploratory borings are representative of subsurface conditions throughout the site. If during construction, subsurface conditions differ from those encountered in the exploratory borings are observed or appear to be present beneath excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. Unless specifically noted, the scope of our services did not include an assessment of the effects of flooding and natural erosion of creeks or rivers adjacent to the project site.

If there is a substantial lapse in time between the submittal of this report and the start of work at this site, or if site conditions are changed due to natural causes or construction operations, we recommend that this report be reviewed to determine the applicability of conclusions and recommendations considering the changed conditions and time lapse.

In order for us to provide a complete professional geotechnical engineering service, we should be retained to observe construction, particularly site grading, earthwork and foundation construction.

The scope of our services for this phase of the project does not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic material in the soil, surface or ground water or air, on or below this site. Any statements in this report or on the boring logs regarding any odors or unusual or suspicious items or conditions observed are strictly for the information of our client.

This report was prepared for the exclusive use of the owner, architect, or engineer for evaluating the design of the project as it relates to the geotechnical aspects discussed herein. It should be made available to prospective contractors for information on factual data only and not as a warranty of subsurface conditions included in this report. Unanticipated soil conditions or rock may require that additional expense be made to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

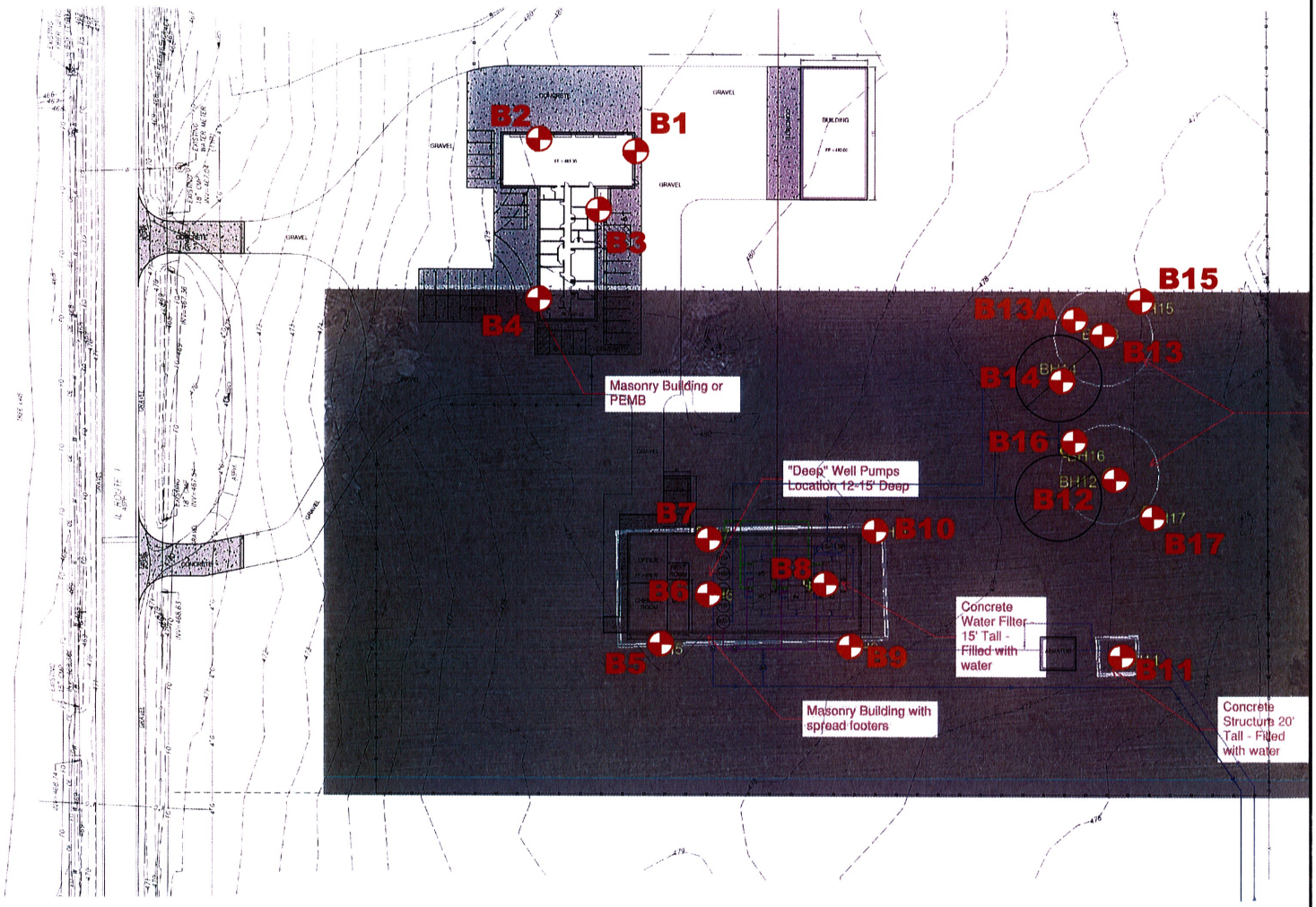
It is recommended that we be retained to review final project layout and those portions of plans and specifications which pertain to foundations and earthwork to determine if they are consistent with our findings and recommendations.

Tristan W. Hudgens, E.I.

Timothy J. Holcomb, P.E.



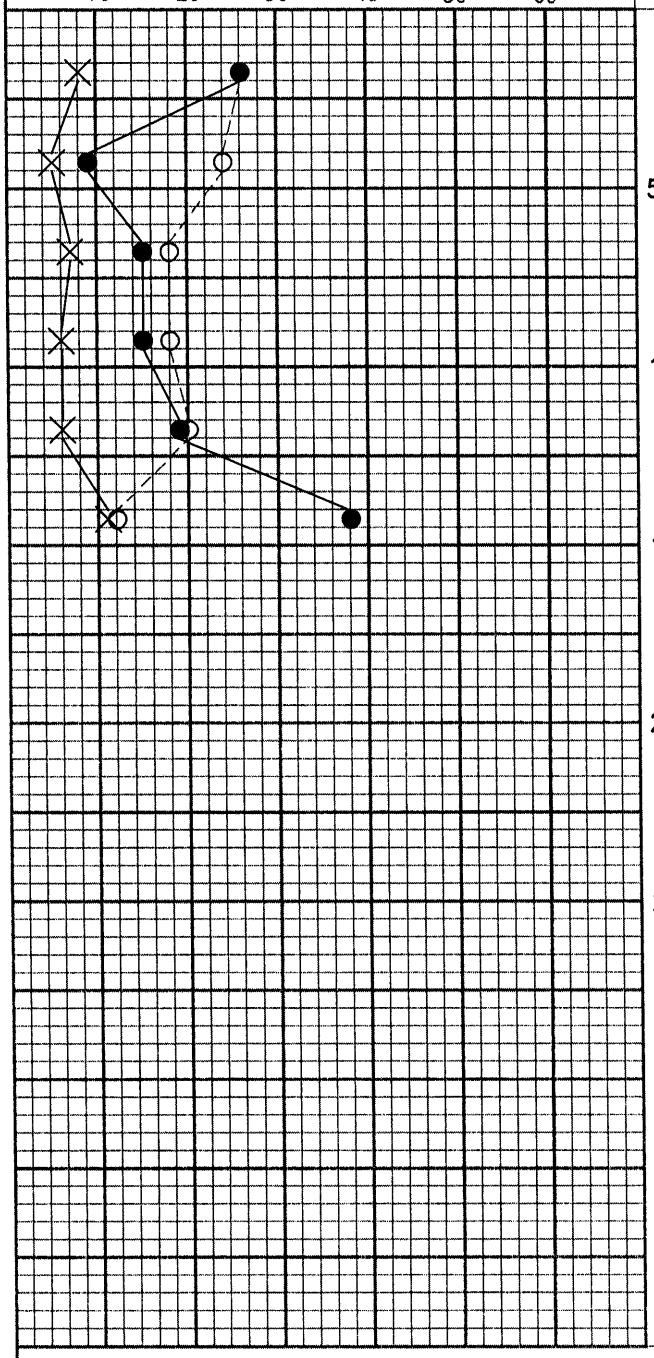
Expires 11-30-23



Project: **Robinson Water Treatment Facility** **Robinson, Illinois** ***Client:*** **Farnsworth Group, Inc.** **Effingham, Illinois**	**Boring Location Diagram**	**Project No. H-21257** North **Not to Scale** **December 13, 2021**

Holcomb Foundation Engineering Co.
393 Wood Road Carbondale, Illinois

LOG of BORING 1



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				8" Topsoil
	1	ss		Brown Silty CLAY (CL) w/sand
	2	ss		
5	3	ss		
	4	ss		
10	5	ss		
	6	ss		Brown Silty CLAY (CL) w/gravel
15				End of Boring @ -15.0'
20				
25				
30				
35				

Ground Water Data
No Ground Water Encountered During Drilling and Dry Upon Completion.

Project: Robinson Water Treatment Facility
Robinson, Illinois

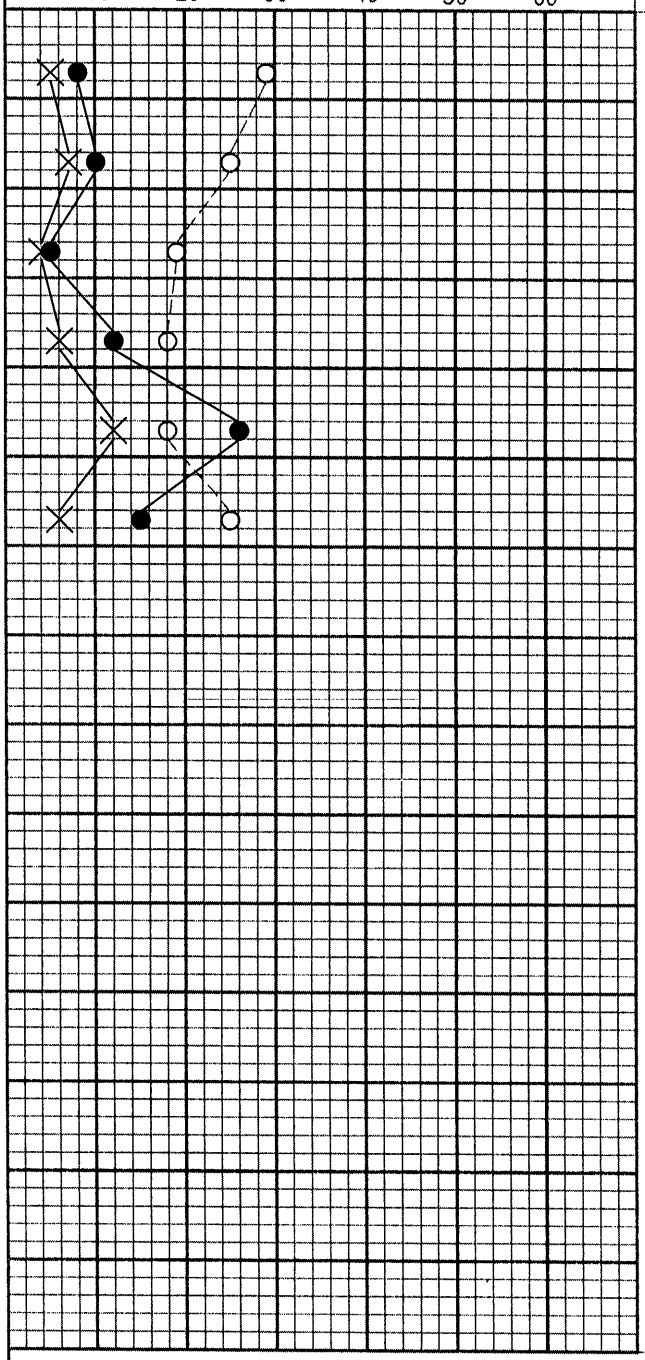
Date of Boring
December 13, 2021

Client: Farnsworth Group, Inc.
Effingham, Illinois

Project No.
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Holcomb Foundation Engineering Co.
393 Wood Road Carbondale, Illinois

LOG of BORING 2



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				8" Topsoil
	1	ss		Brown Silty CLAY (CL)
	2	ss		
5				
	3	ss		Brown Silty CLAY (CL) w/gravel
	4	ss		
10				
	5	ss		
	6	ss		
15				End of Boring @ −15.0'
20				
25				
30				
35				

Ground Water Data
No Ground Water Encountered During Drilling and Dry Upon Completion.

Project: Robinson Water Treatment Facility
Robinson, Illinois

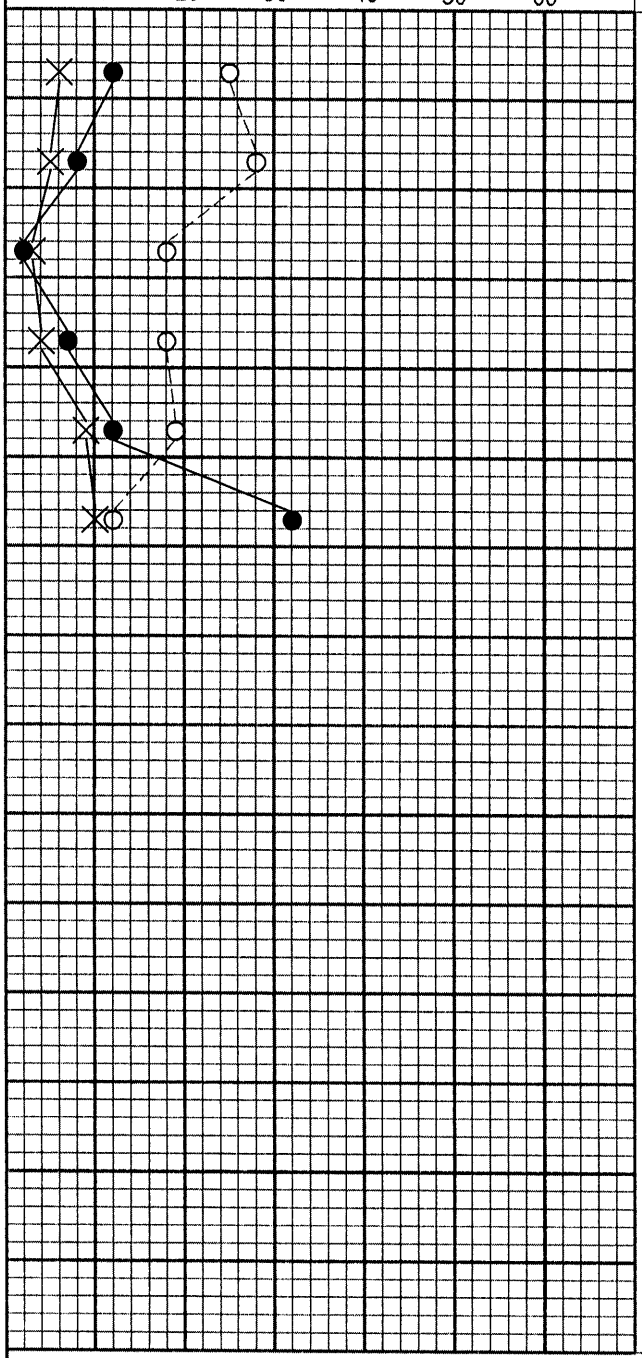
Date of Boring
December 13, 2021

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Effingham, Illinois

Project No.
H−21257

Holcomb Foundation Engineering Co.
393 Wood Road Carbondale, Illinois

LOG of BORING 3



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				8" Topsoil
	1	ss		Brown Silty CLAY (CL)
	2	ss		
5				
	3	ss		Brown Sandy CLAY (CL)
	4	ss		
10				
	5	ss		
	6	ss		Brown Silty CLAY (CL) w/gravel
15				End of Boring @ -15.0'
20				
25				
30				
35				

Ground Water Data
No Ground Water Encountered During Drilling and Dry Upon Completion.

Project: Robinson Water Treatment Facility
Robinson, Illinois

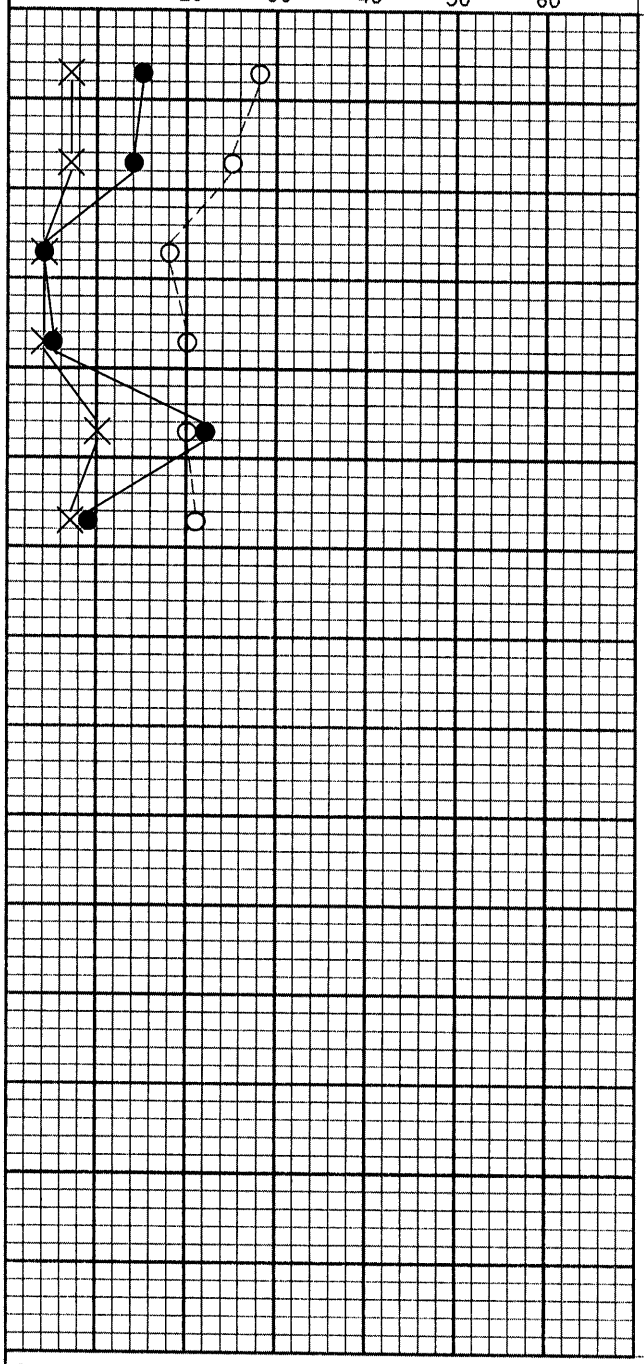
Date of Boring
December 13, 2021

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Effingham, Illinois

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LOG of BORING 4



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				7" Topsoil
	1	ss		Brown Silty CLAY (CL)
5	2	ss		
	3	ss		Brown Sandy CLAY (CL)
10	4	ss		
	5	ss		Brown Silty CLAY (CL) w/sand and gravel
15	6	ss		
				End of Boring @ -15.0'
20				
25				
30				
35				

Ground Water Data
Ground Water Encountered @ -13.5' During Drilling and Plugged @ -6.0'.

Project: Robinson Water Treatment Facility
Robinson, Illinois

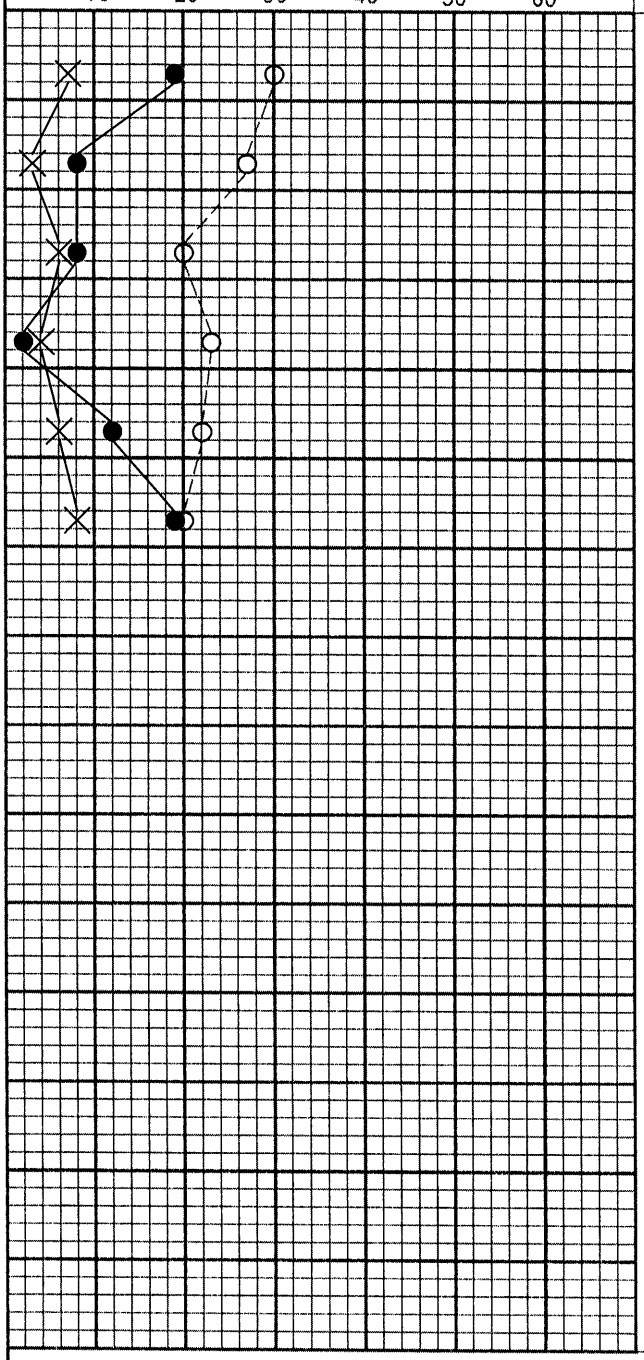
Date of Boring
December 13, 2021

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Effingham, Illinois

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LOG of BORING 5



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				7" Topsoil
	1	ss		Brown Silty CLAY (CL)
	2	ss		
5				
	3	ss		Brown Mottled Gray Silty CLAY (CL) w/gravel
	4	ss		Brown Silty CLAY (CL) w/sand
10				
	5	ss		Brown Silty CLAY (CL) w/sand and gravel
	6	ss		
15				End of Boring @ −15.0'
20				
25				
30				
35				

Ground Water Data
Ground Water Encountered @ −11.0' During Drilling and @ −10.0' Upon Completion.

Project: Robinson Water Treatment Facility
Robinson, Illinois

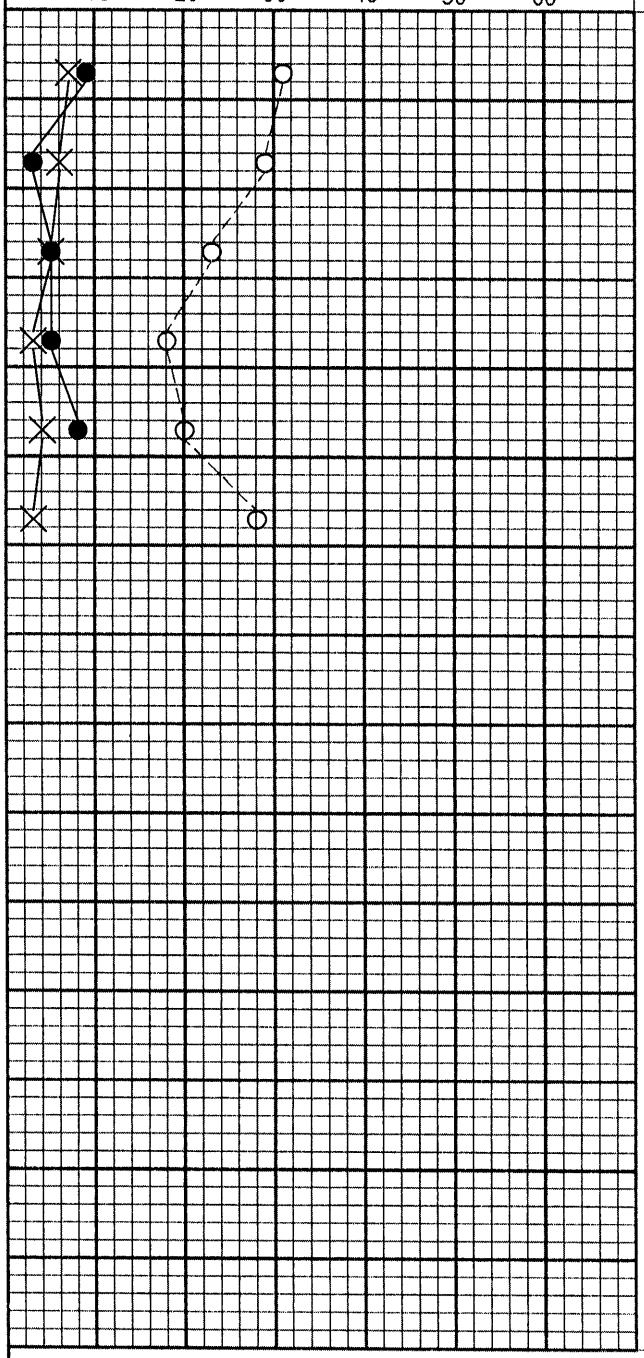
Date of Boring
December 13, 2021

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Effingham, Illinois

Project No.
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393 Wood Road Carbondale, Illinois

LOG of BORING 6



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				7" Topsoil
	1	ss		Brown Silty CLAY (CL)
5	2	ss		Brown SILT (ML) w/sand
	3	ss		
10	4	ss		Brown Sandy CLAY (CL)
	5	ss		
15	6	ss		Brown Mottled Gray Silty CLAY (CL) w/sand
				End of Boring @ −15.0'
20				
25				
30				
35				

Ground Water Data
No Ground Water Encountered During Drilling and @ −10.0' Upon Completion.

Project: Robinson Water Treatment Facility
Robinson, Illinois

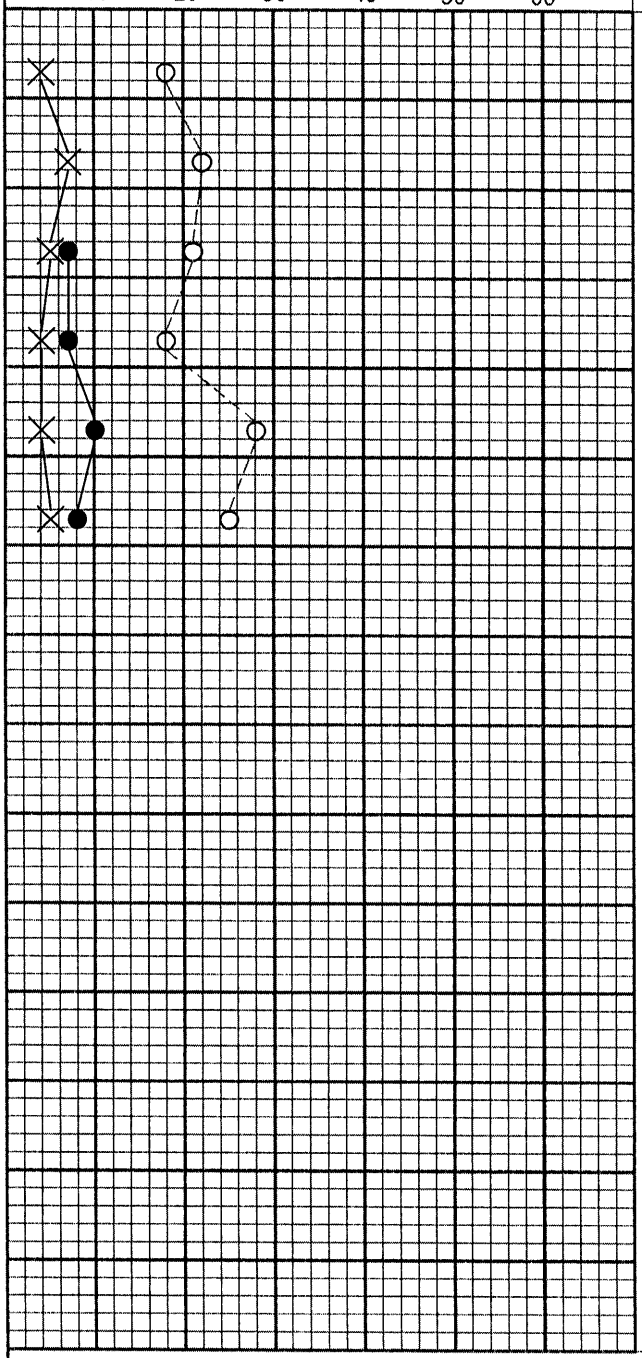
Date of Boring
December 13, 2021

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Effingham, Illinois

Project No.
H-21257

Holcomb Foundation Engineering Co.
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LOG of BORING 7



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				8" Topsoil
	1	ss		Brown Silty CLAY (CL)
	2	ss		Brown SAND (SP) w/clay
5	3	ss		Brown Silty CLAY (CL)
	4	ss		Brown Sandy CLAY (CL)
10	5	ss		Brown Mottled Gray Silty CLAY (CL) w/sand and gravel
	6	ss		
15				End of Boring @ −15.0'
20				
25				
30				
35				

Ground Water Data
No Ground Water Encountered During Drilling and @ −10.0' Upon Completion.

Project: Robinson Water Treatment Facility
Robinson, Illinois

Date of Boring
December 13, 2021

Client: Farnsworth Group, Inc.
Effingham, Illinois

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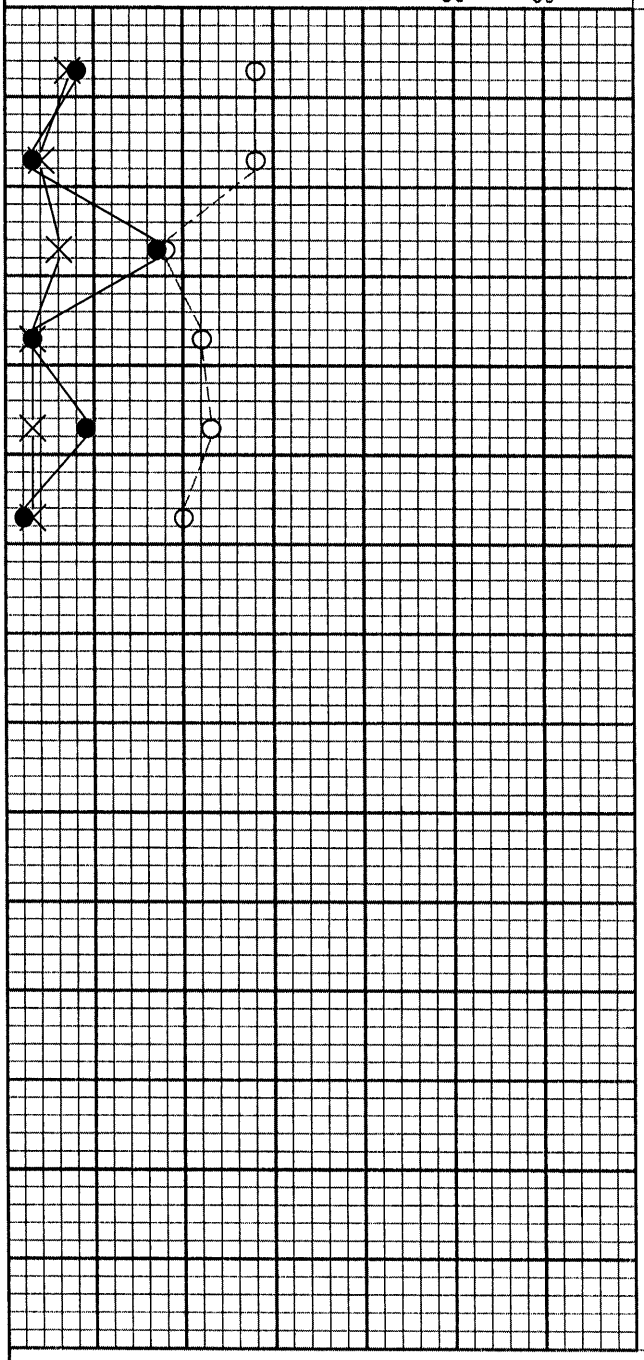
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LOG of BORING 8

Unconfined Compressive Strength (Tons/Sq. Ft.)
1 2 3 4 5 6

Water Content (%)

Standard N Penetration, Blows/Ft.
10 20 30 40 50 60



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				8" Topsoil
	1	ss		Brown Mottled Gray Silty CLAY (CL)
	2	ss		
5	3	ss		
	4	ss		Brown Mottled Gray Sandy CLAY(CL)
10	5	ss		
	6	ss		
15				End of Boring @ −15.0'
20				
25				
30				
35				

Ground Water Data
No Ground Water Encountered During Drilling and @ −10.0' Upon Completion.

Project: Robinson Water Treatment Facility
Robinson, Illinois

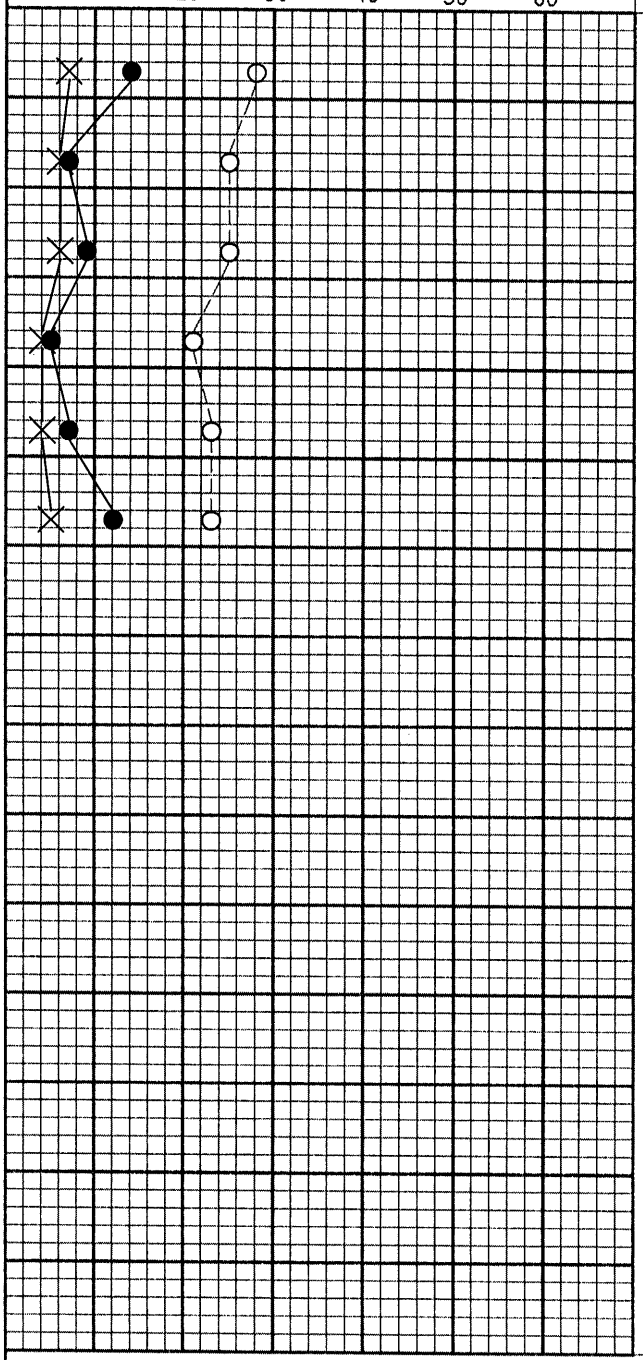
Date of Boring
December 13, 2021

Client: Farnsworth Group, Inc.
Effingham, Illinois

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393 Wood Road Carbondale, Illinois

LOG of BORING 9



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				7" Topsoil
	1	ss		Brown Mottled Gray Silty CLAY (CL)
5	2	ss		Brown Mottled Gray Sandy CLAY(CL)
	3	ss		Gray Mottled Brown SILT (ML) w/clay
10	4	ss		Brown Mottled Gray Silty CLAY (CL) w/sand
	5	ss		
15	6	ss		Brown Mottled Gray Silty CLAY (CL) w/sand and gravel
				End of Boring @ -15.0'
20				
25				
30				
35				

Ground Water Data
No Ground Water Encountered During Drilling and @ -10.0' Upon Completion.

Project: Robinson Water Treatment Facility
Robinson, Illinois

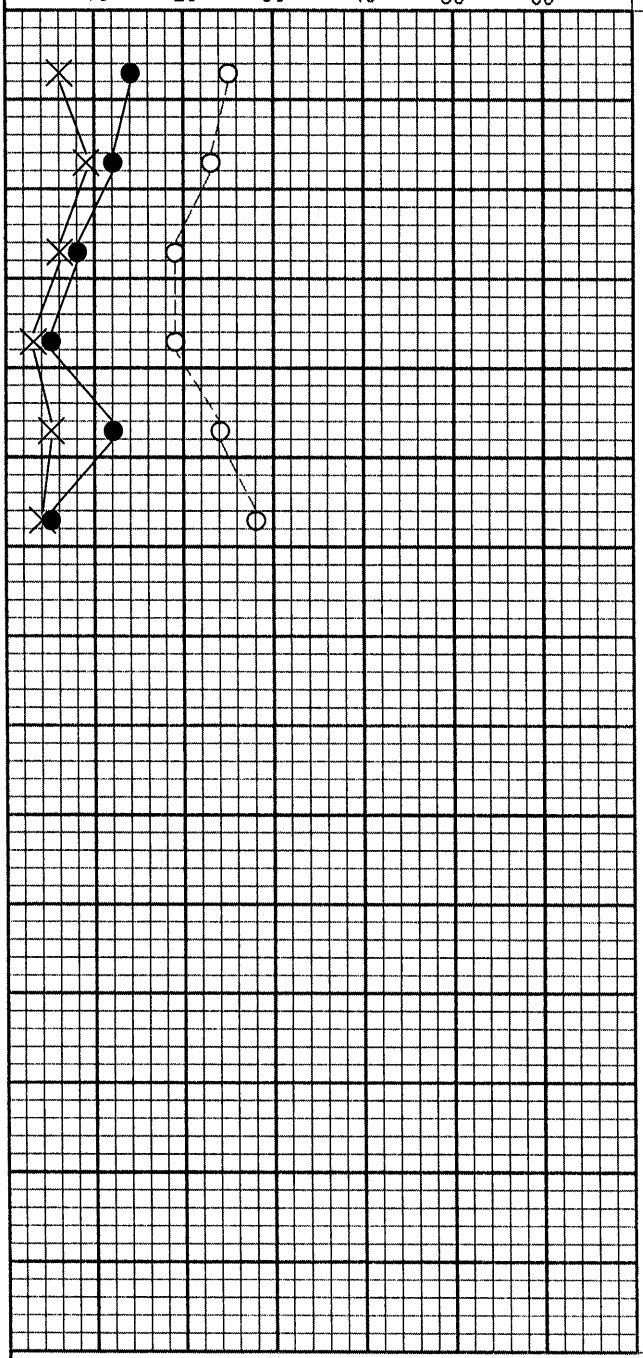
Date of Boring
December 13, 2021

Client: Farnsworth Group, Inc.
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Project No.
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LOG of BORING 10



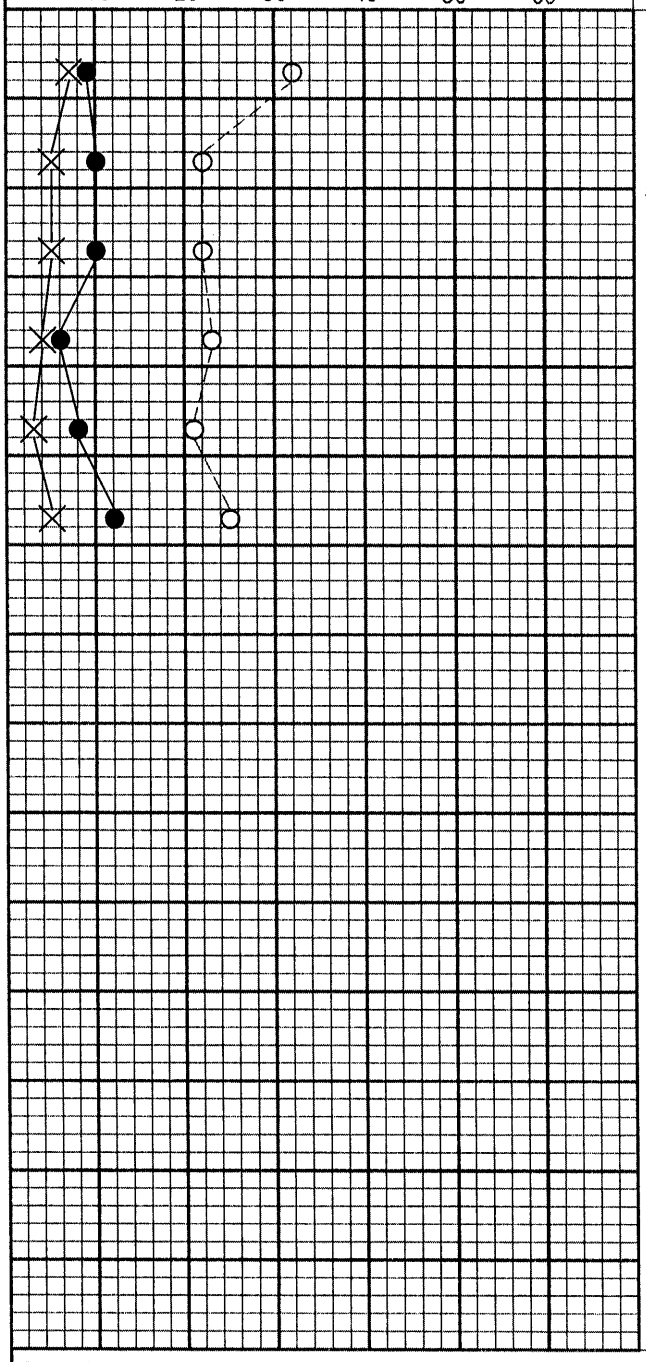
Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				7" Topsoil
	1	ss		Brown Mottled Gray Silty CLAY (CL) w/sand
5	2	ss		
	3	ss		Brown Sandy CLAY (CL)
	4	ss		Brown Mottled Gray Silty CLAY (CL) w/sand and gravel
10	5	ss		
	6	ss		
15				End of Boring @ −15.0'
20				
25				
30				
35				

Ground Water Data
Ground Water Encountered @ −13.5' During Drilling and @ −10.0' Upon Completion.

Project: Robinson Water Treatment Facility Robinson, Illinois	Date of Boring December 13, 2021
Client: Farnsworth Group, Inc. Effingham, Illinois	Project No. H-21257

Holcomb Foundation Engineering Co.
393 Wood Road Carbondale, Illinois

LOG of BORING 11



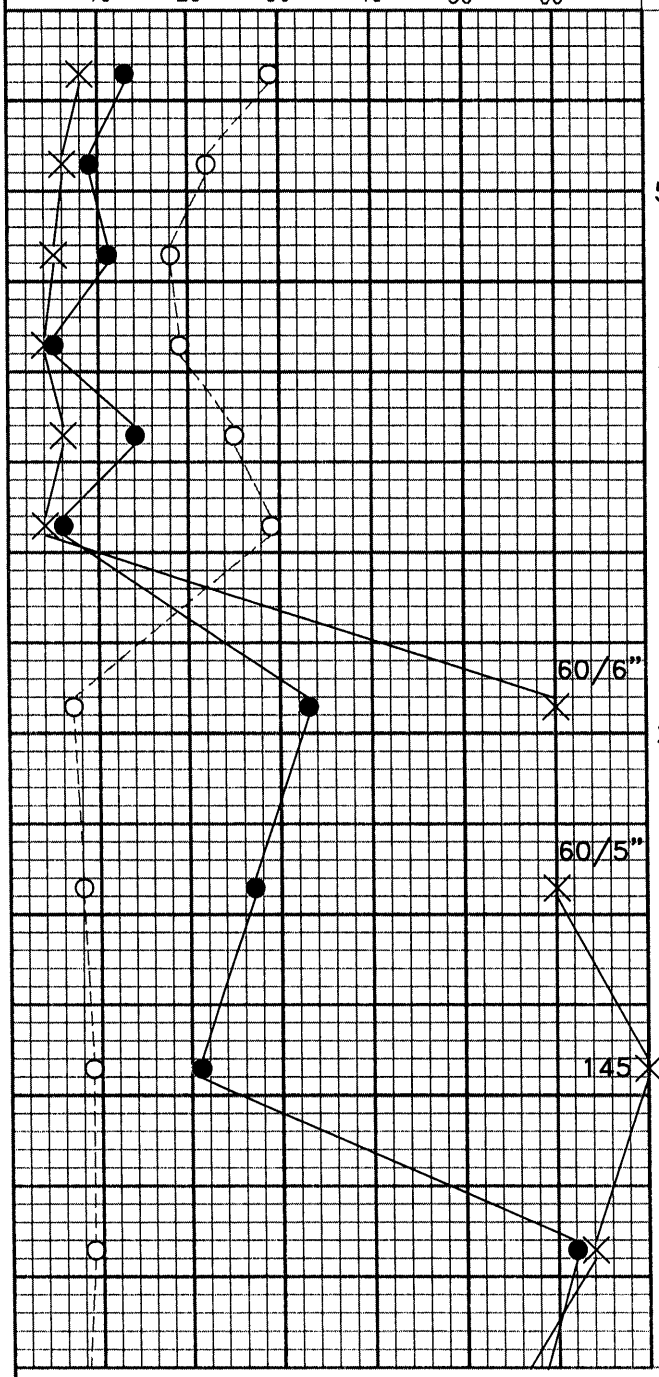
Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				7" Topsoil
	1	ss		Brown Mottled Gray Silty CLAY (CL)
	2	ss		
5				
	3	ss		Gray Mottled Brown Silty CLAY (CL)
	4	ss		Gray Mottled Brown Silty CLAY (CL) w/gravel
10				
	5	ss		
	6	ss		
15				End of Boring @ −15.0'
20				
25				
30				
35				

Ground Water Data
No Ground Water Encountered During Drilling and Plugged @ −8.0'.

Project: Robinson Water Treatment Facility Robinson, Illinois	Date of Boring December 13, 2021
Client: Farnsworth Group, Inc. Effingham, Illinois	Project No. H−21257

Holcomb Foundation Engineering Co.
393 Wood Road Carbondale, Illinois

LOG of BORING 12



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				8" Topsoil
	1	ss		Brown Mottled Gray Silty CLAY (CL)
5	2	ss		
	3	ss		
10	4	ss		Brown Silty CLAY (CL) w/sand and gravel
	5	ss		
15	6	ss		Brown Mottled Gray Silty CLAY (CL) w/sand and gravel
20	7	ss		Brown Silty CLAY (CL) w/sand and gravel
25	8	ss		Gray Silty CLAY (CL) w/sand and gravel
30	9	ss		
35	10	ss		

Ground Water Data

Ground Water Encountered @ −18.5' During Drilling and @ −17.0' Upon Completion.

Project: Robinson Water Treatment Facility Robinson, Illinois	Date of Boring December 9, 2021
Client: Farnsworth Group, Inc. Effingham, Illinois	Project No. H−21257

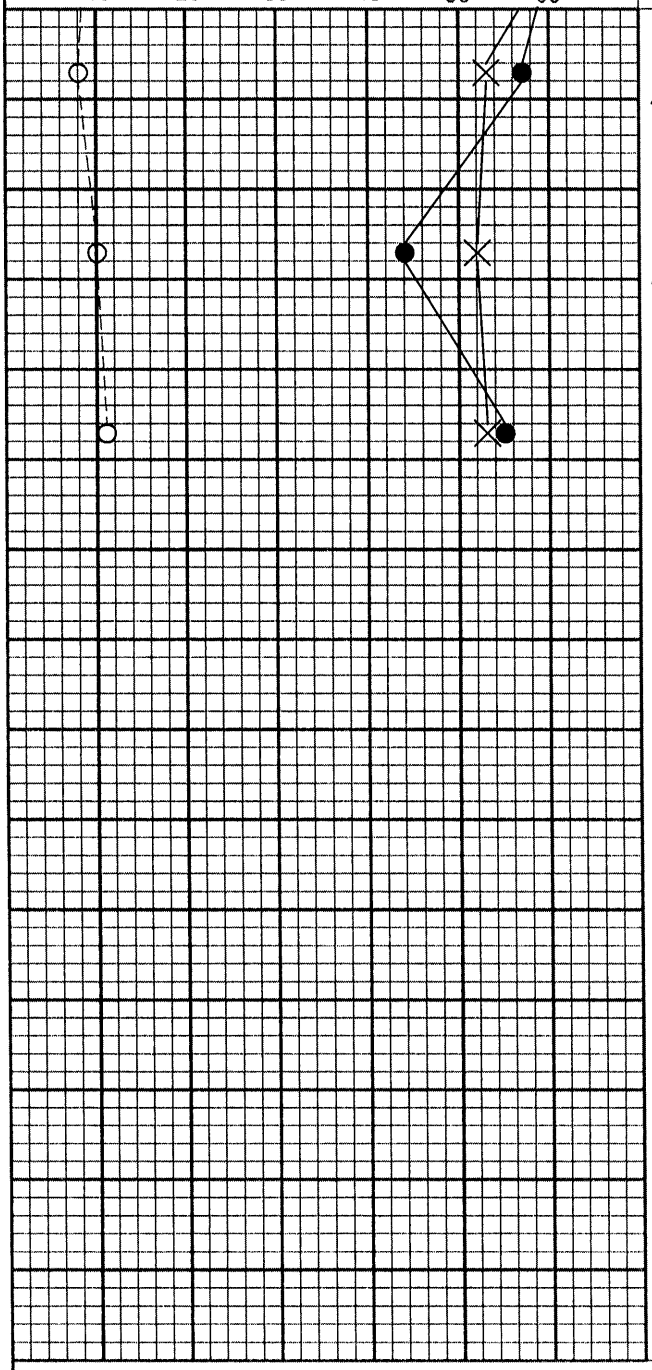
Holcomb Foundation Engineering Co.
393 Wood Road Carbondale, Illinois

LOG of BORING 12

Unconfined Compressive Strength (Tons/Sq. Ft.)
1 2 3 4 5 6

Water Content (%)

Standard N Penetration, Blows/Ft.
10 20 30 40 50 60



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				silty clay w/sand and gravel (continued)
40	11	ss		
45	12	ss		
	13	ss		
50				End of Boring @ −50.0'
55				
60				
65				
70				

Ground Water Data
Ground Water Encountered @ −18.5' During Drilling and @ −17.0' Upon Completion.

Project: Robinson Water Treatment Facility
Robinson, Illinois

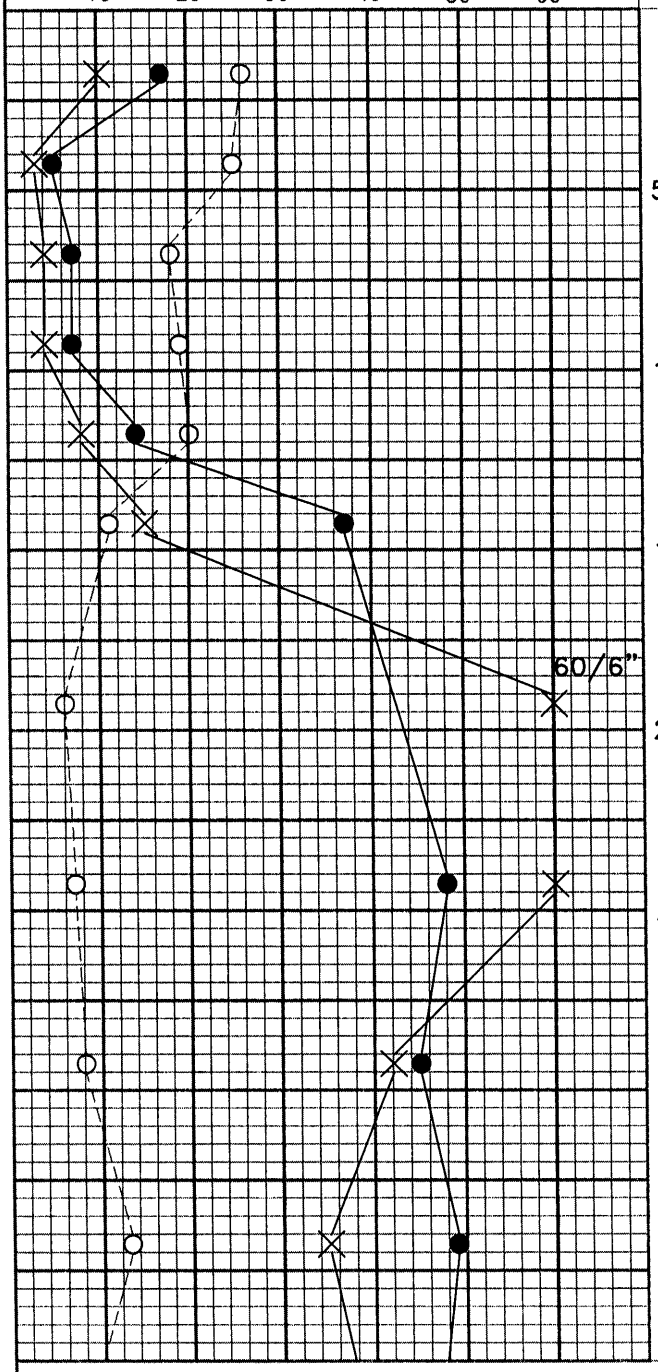
Date of Boring
December 9, 2021

Client: Farnsworth Group, Inc.
Effingham, Illinois

Project No.
H−21257

Holcomb Foundation Engineering Co.
393 Wood Road Carbondale, Illinois

LOG of BORING 13



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				7" Topsoil
	1	ss		Brown Mottled Gray Silty CLAY (CL)
5	2	ss		
	3	ss		Brown Silty CLAY (CL) w/sand and gravel
	4	ss		
10	5	ss		
	6	ss		
15				
	7	ss		Gray Silty CLAY (CL) w/sand and gravel
20				
	8	ss		
25				
	9	ss		
30				
	10	ss		
35				

Ground Water Data

No Ground Water Encountered During Drilling and @ −32.0' Upon Completion.

Project: Robinson Water Treatment Facility
Robinson, Illinois

Date of Boring
December 9, 2021

Client: Farnsworth Group, Inc.
Effingham, Illinois

Project No.
H−21257

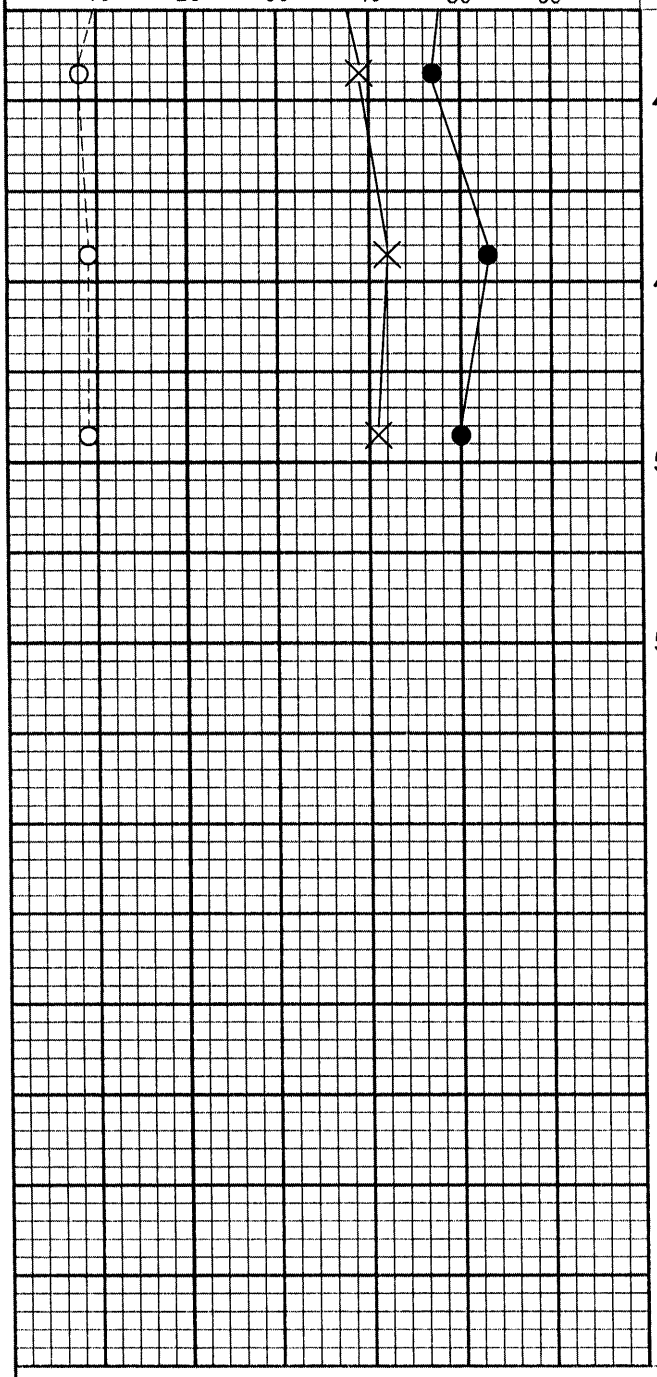
Holcomb Foundation Engineering Co.
393 Wood Road Carbondale, Illinois

LOG of BORING 13

Unconfined Compressive Strength (Tons/Sq. Ft.)
1 2 3 4 5 6

Water Content (%)

Standard N Penetration, Blows/Ft.
10 20 30 40 50 60



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				silty clay w/sand and gravel (continued)
40	11	ss		
45	12	ss		
50	13	ss		
				End of Boring @ −50.0'
55				
60				
65				
70				

Ground Water Data
No Ground Water Encountered During Drilling and @ −32.0' Upon Completion.

Project: Robinson Water Treatment Facility
Robinson, Illinois

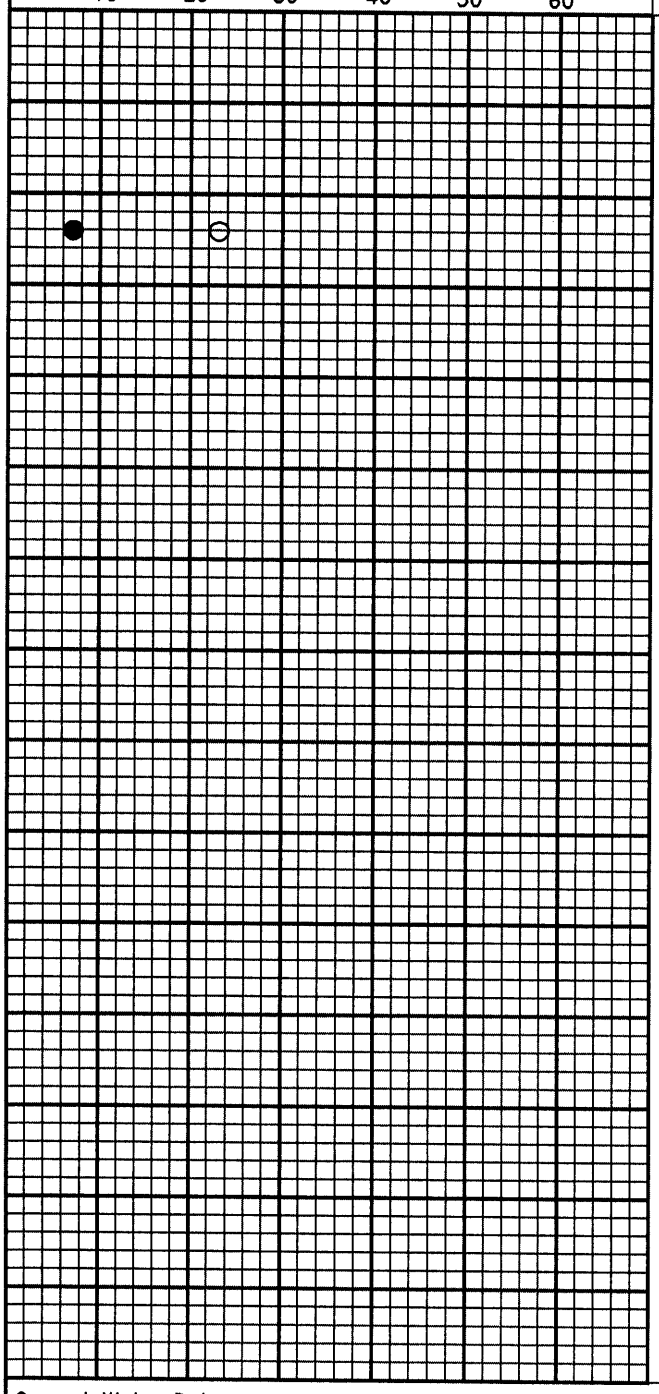
Date of Boring
December 9, 2021

Client: Farnsworth Group, Inc.
Effingham, Illinois

Project No.
H-21257

LOG of BORING 13A

Holcomb Foundation Engineering Co.



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				7" Topsoil
				Brown Mottled Gray Silty CLAY (CL)
5	1	st		
	2	st		
	3	st		Brown Silty CLAY (CL) with sand
10				End of Boring @ -9.0'
15				
20				
25				
30				
35				

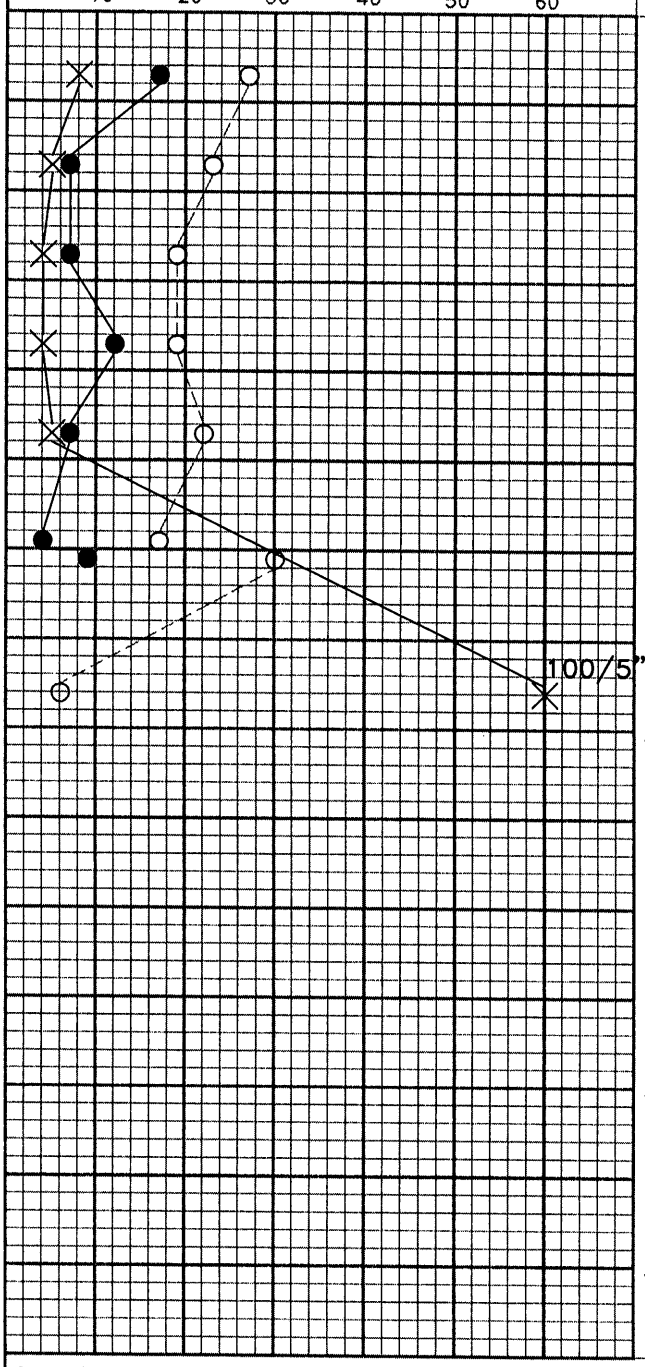
Ground Water Data

No Ground Water Encountered During Drilling or Upon Completion.

Project: Robinson Water Treatment Facility Robinson, Illinois	Date of Boring February 14, 2022
Client: The Farnsworth Group Effingham, Illinois	Project No. H-21257

Holcomb Foundation Engineering Co.
393 Wood Road Carbondale, Illinois

LOG of BORING 14



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				7" Topsoil
	1	ss		Brown Mottled Gray Silty CLAY (CL)
	2	ss		
5				
	3	ss		Brown Mottled Gray Silty CLAY (CL) w/sand and gravel
	4	ss		
10				
	5	ss		
	6	st		
15				
				Brown Silty CLAY (CL)
	7	ss		w/sand and gravel
20				End of Boring @ −19.5'
25				
30				
35				

Ground Water Data
Ground Water Encountered @ −13.5' During Drilling and @ −11.0' Upon Completion.

Project: Robinson Water Treatment Facility
Robinson, Illinois

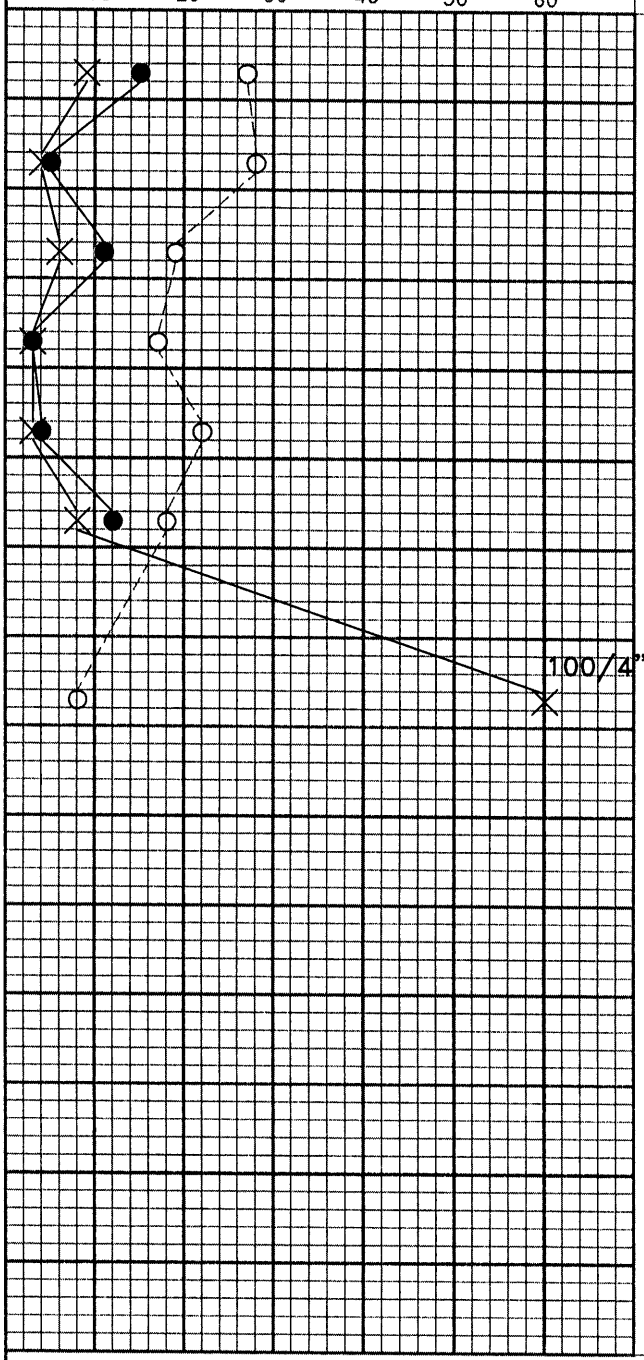
Date of Boring
December 10, 2021

Client: Farnsworth Group, Inc.
Effingham, Illinois

Project No.
H−21257

Holcomb Foundation Engineering Co.
393 Wood Road Carbondale, Illinois

LOG of BORING 15



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				8" Topsoil
	1	ss		Brown Silty CLAY (CL)
	2	ss		
5				
	3	ss		Brown Silty CLAY (CL) w/sand and gravel
	4	ss		
10				
	5	ss		
	6	ss		
15				
	7	ss		
20				End of Boring @ −20.0'
25				
30				
35				

Ground Water Data

Ground Water Encountered @ −15.0' During Drilling and @ −10.0' Upon Completion.

Project: Robinson Water Treatment Facility
Robinson, Illinois

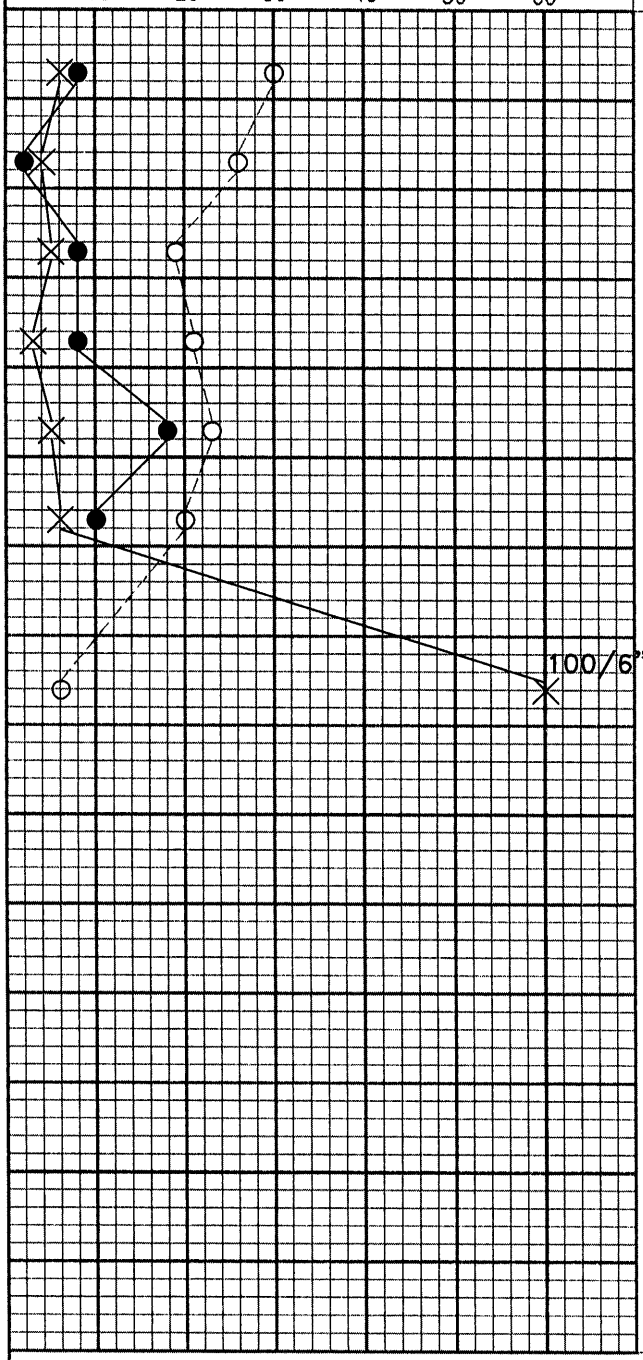
Date of Boring
December 10, 2021

Client: Farnsworth Group, Inc.
Effingham, Illinois

Project No.
H−21257

Holcomb Foundation Engineering Co.
393 Wood Road Carbondale, Illinois

LOG of BORING 16



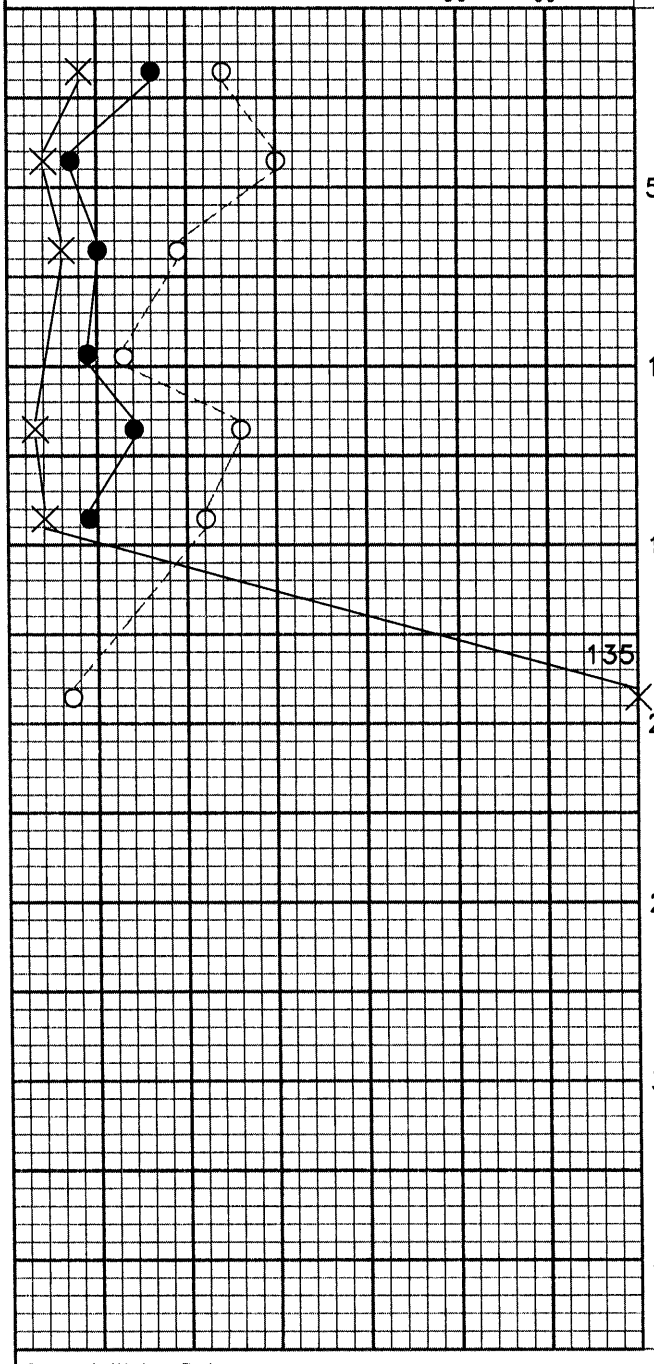
Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				7" Topsoil
	1	ss		Brown Mottled Gray Silty CLAY (CL)
	2	ss		
5				
	3	ss		Brown Mottled Gray Silty CLAY (CL) w/sand and gravel
	4	ss		
10				
	5	ss		
	6	ss		Gray Mottled Brown Silty CLAY (CL) w/sand and gravel
15				
	7	ss		Gray Mottled Brown Silty CLAY (CL) w/sand, gravel and shale
20				End of Boring @ −19.5'
25				
30				
35				

Ground Water Data
Ground Water Encountered @ −15.0' During Drilling and Plugged @ −11.0'.

Project: **Robinson Water Treatment Facility** **Robinson, Illinois**	**Date of Boring** **December 10, 2021**
Client: **Farnsworth Group, Inc.** **Effingham, Illinois**	**Project No.** **H-21257**

Holcomb Foundation Engineering Co.
393 Wood Road Carbondale, Illinois

LOG of BORING 17



Depth in Feet	Sample No.	Type Sample	Sample Distance	Description of Material
				Surface Elevation
				7" Topsoil
	1	ss		Brown Mottled Gray Silty CLAY (CL)
	2	ss		
5	3	ss		
	4	st		
10	5	ss		
	6	ss		Brown Mottled Gray Silty CLAY (CL) w/sand and gravel
15				
	7	ss		Gray Mottled Brown Silty CLAY (CL) w/sand and gravel
20				End of Boring @ −20.0'
25				
30				
35				

Ground Water Data
Ground Water Encountered @ −15.0' During Drilling and @ −10.0' Upon Completion.

Project: Robinson Water Treatment Facility Robinson, Illinois	Date of Boring December 10, 2021
Client: Farnsworth Group, Inc. Effingham, Illinois	Project No. H−21257

Holcomb Foundation Engineering Company

Unit Weight Worksheet

Project: Robinson Water Treatment Plant Buildings
Project No.: H-21257 Date: 12/16/2021

Boring	Depth (Ft.)	Wet Wt. g	Pan g	Dry Wt. g	Mc. (%)	Length in	Diameter in	Dry Unit Wt. pcf	Qu tsf
B-14	14.5'-15.0'	1258.1	128.2	1097.6	16.6	5.582	2.8	107.5	0.4
B-14	15.0'-15.5'	1307.9	94.6	1027.7	30.0	5.336	2.8	108.2	0.9
B-17	9.0'-9.5'	1290.3	84.0	1155.8	12.5	5.574	2.8	119.0	0.9

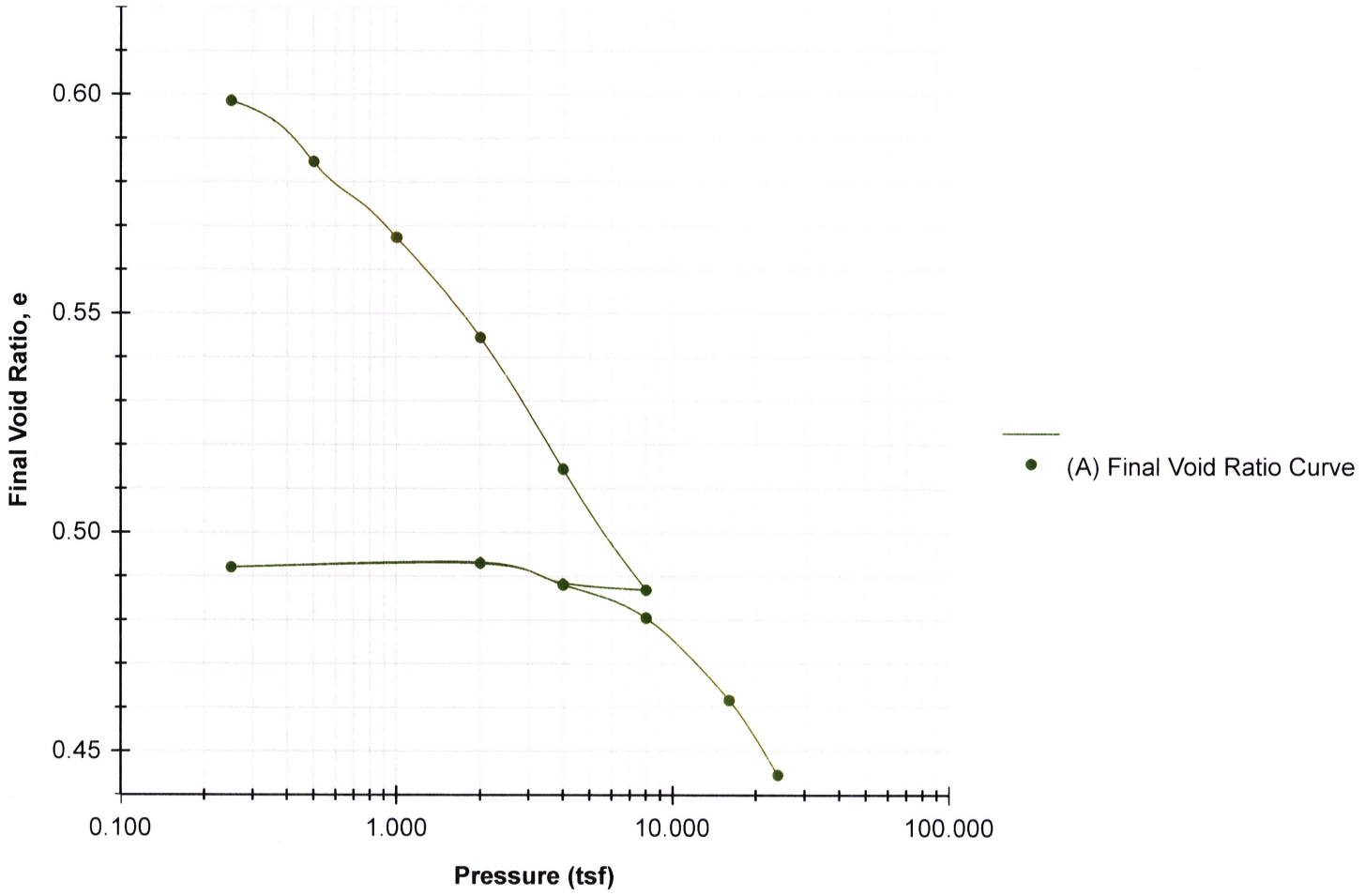
Water Treatment Plant

Robinson, Illinois

Consolidation Test Results

Boring #13A (6.5-7.0')

Final Voids [Log]

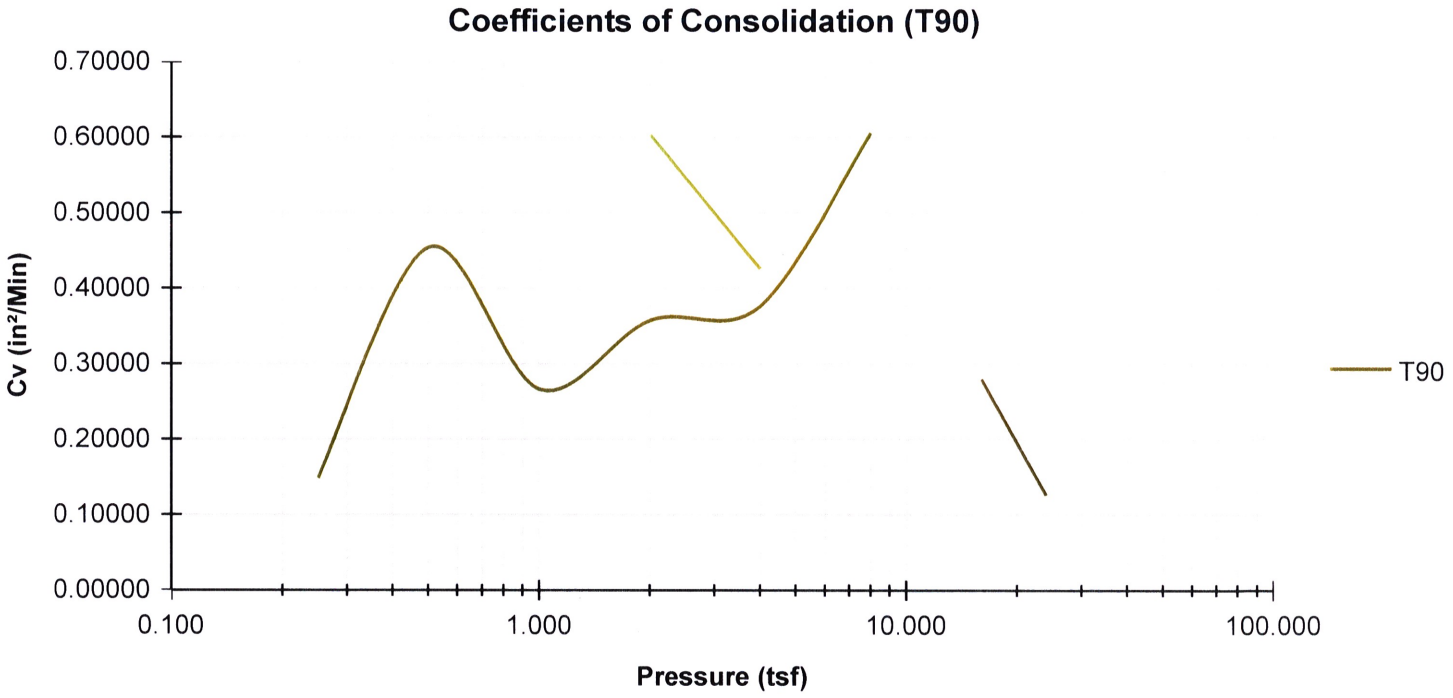


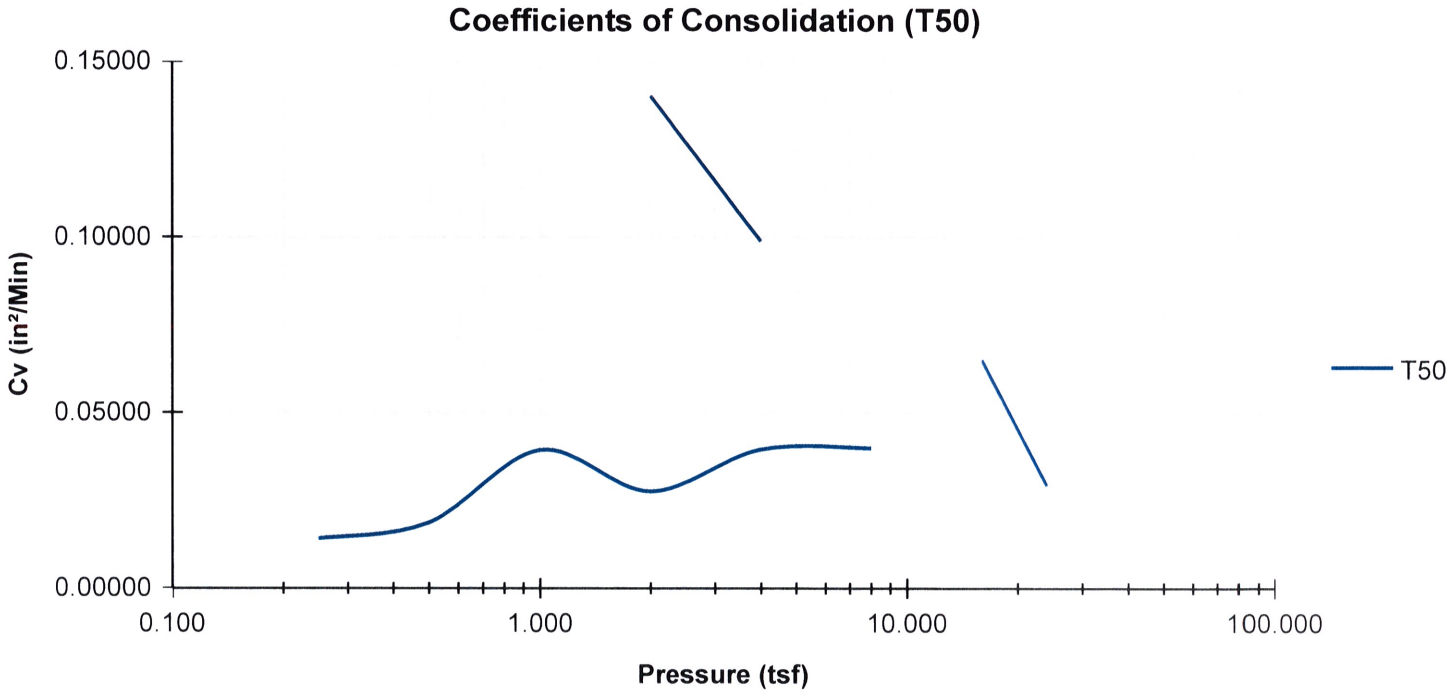
Preconsolidation Stress (tsf)	0.000	Cc	0.096	Cr	0.052

	BEFORE	AFTER	Liquid Limits	0	Test Date 2/15/2022
Moisture (%)	23.1	16.5	Plastic Limits	0	
Dry Density (pcf)	101.3	114.6			
Saturation (%)	96.7	98.9			
Void Ratio	0.63	0.44	Specific Gravity	2.65	ASSUMED

Sample Description	Brown SiltY CLAY			Remarks
Project Number	H21257	Depth (ft)	6.5-7.0	
Sample Number	ST-2	Boring Number	B13A	
Project	Robinson Water Treatment Plant			
Client				
Location				

Coefficients of Consolidation





Summary

Sample Description	Brown SiltY CLAY			
Project Number	H21257	**Depth (ft)**	6.5-7.0	**Remarks**
Sample Number	ST-2	**Boring Number**	B13A	
Project	Robinson Water Treatment Plant			
Client				
Location				

Index	Loading Sequence (tsf)	Cummulative Change in Height (in)	Specimen Height (in)	Height of Voids (in)	Vertical Strain (%)	Void Ratio	T90 Fitting Time (Hr)	T50 Fitting Time (Hr)	T90 Cv (in²/Min)	T50 Cv (in²/Min)	Sequence Status
0	0.000	0.0000	1.0290	0.0000	0.0	0.633	0.000	0.000	0.00000	0.00000	ENABLED
1	0.250	0.0198	1.0092	0.3779	1.9	0.599	0.095	0.058	0.14809	0.01419	ENABLED
2	0.500	0.0285	1.0005	0.3691	2.8	0.585	0.030	0.042	0.45391	0.01868	ENABLED
3	1.000	0.0394	0.9896	0.3582	3.8	0.567	0.052	0.019	0.26629	0.03940	ENABLED
4	2.000	0.0538	0.9752	0.3438	5.2	0.545	0.037	0.026	0.35774	0.02766	ENABLED
5	4.000	0.0728	0.9562	0.3248	7.1	0.514	0.032	0.016	0.37634	0.03959	ENABLED
6	8.000	0.0902	0.9388	0.3074	8.8	0.487	0.018	0.015	0.60611	0.03996	ENABLED
7	4.000	0.0892	0.9398	0.3084	8.7	0.488	0.000	0.000	0.00000	0.00000	ENABLED
8	2.000	0.0862	0.9428	0.3114	8.4	0.493	0.000	0.000	0.00000	0.00000	ENABLED
9	0.250	0.0870	0.9420	0.3107	8.5	0.492	0.000	0.000	0.00000	0.00000	ENABLED
10	2.000	0.0864	0.9426	0.3112	8.4	0.493	0.018	0.004	0.60364	0.14023	ENABLED
11	4.000	0.0895	0.9395	0.3082	8.7	0.488	0.027	0.006	0.42592	0.09895	ENABLED
12	8.000	0.0943	0.9347	0.3034	9.2	0.481	0.009	0.000	0.00000	0.00000	ENABLED
13	16.000	0.1061	0.9229	0.2915	10.3	0.462	0.053	0.009	0.28028	0.06511	ENABLED
14	24.000	0.1169	0.9121	0.2807	11.4	0.445	0.105	0.018	0.12594	0.02926	ENABLED

Consolidated Test Results

Project:	Robinson Water Treatment Plant
Project Number:	H21257
Job Number:	
Test Date:	2/15/2022

Sampling Date:	2/14/2022
Sample Number:	ST-2
Depth (ft)	6.5-7.0
Boring Number:	B13A
Location:	
Client Name:	
Remarks:	

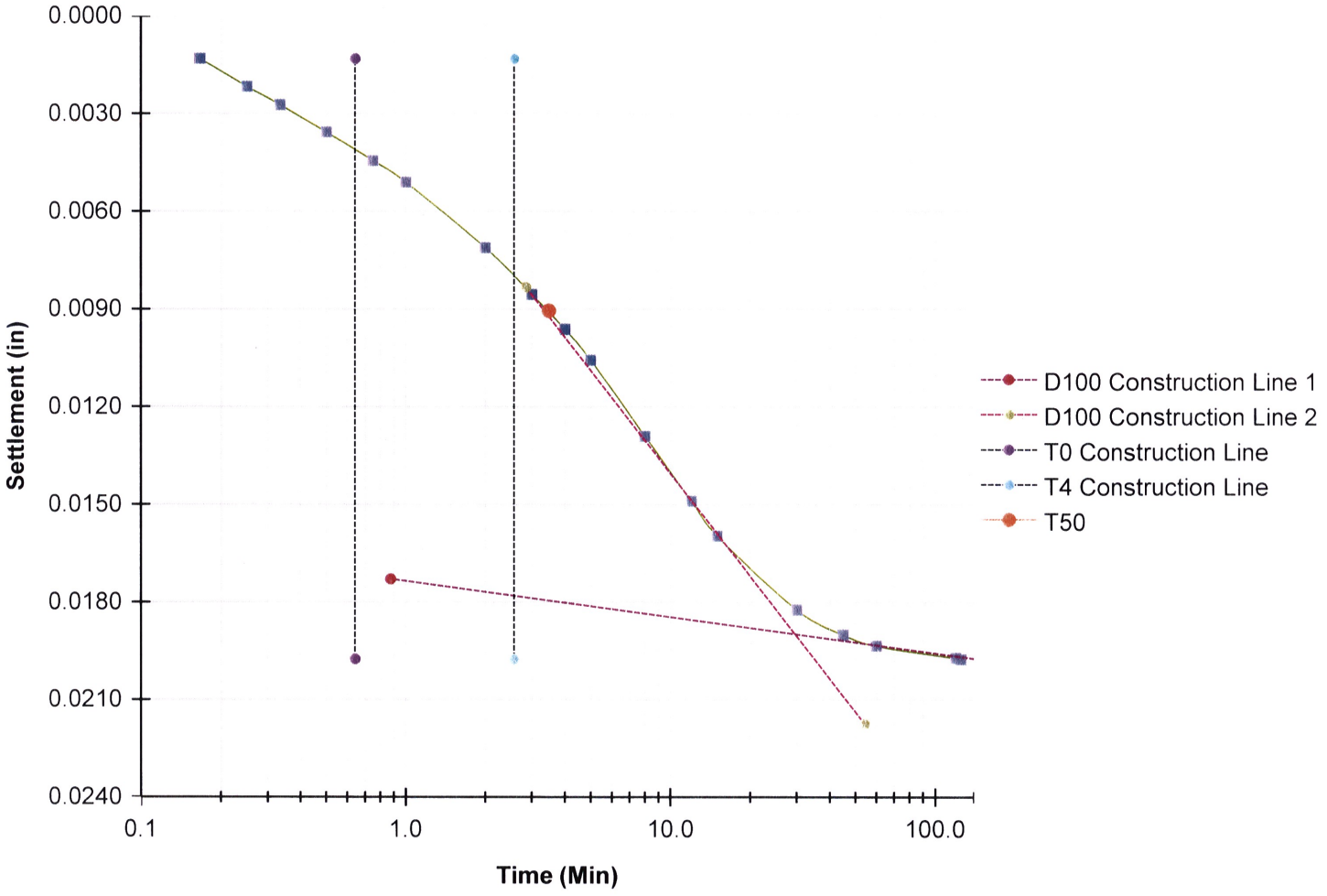
Specific Gravity:	2.65	Plastic Limit:	0	Liquid Limit:	0
Specific Gravity Method:	ASSUMED			Weight of Ring (g)	104.4
Sampling Method:		Soil Classification:			
Specimen Description:	Brown SiltY CLAY				

Parameters	Initial	Final
Height (in)	1.0290	0.9121
Height Source	NA	TEST RESULTS
Diameter (in)	2.4860	NA
Area (in^2)	4.854	NA
Volume (in^3)	4.9947	4.4386
Weight of Container (g)	87.7	81.2
Weight of Wet Soil + Container (g)	1222.6	236.3
Weight of Dry Soil + Container (g)	1009.8	214.3
Moisture Content (%)	23.1	16.5
Moist Weight + Ring Weight (g)	267.9	260.0
Dry Density (pcf)	101.3	114.6
Wet Density (pcf)	124.7	133.6
Saturation (%)	96.7	98.9
Void Ratio	0.6	0.4

Consolidation Test Results

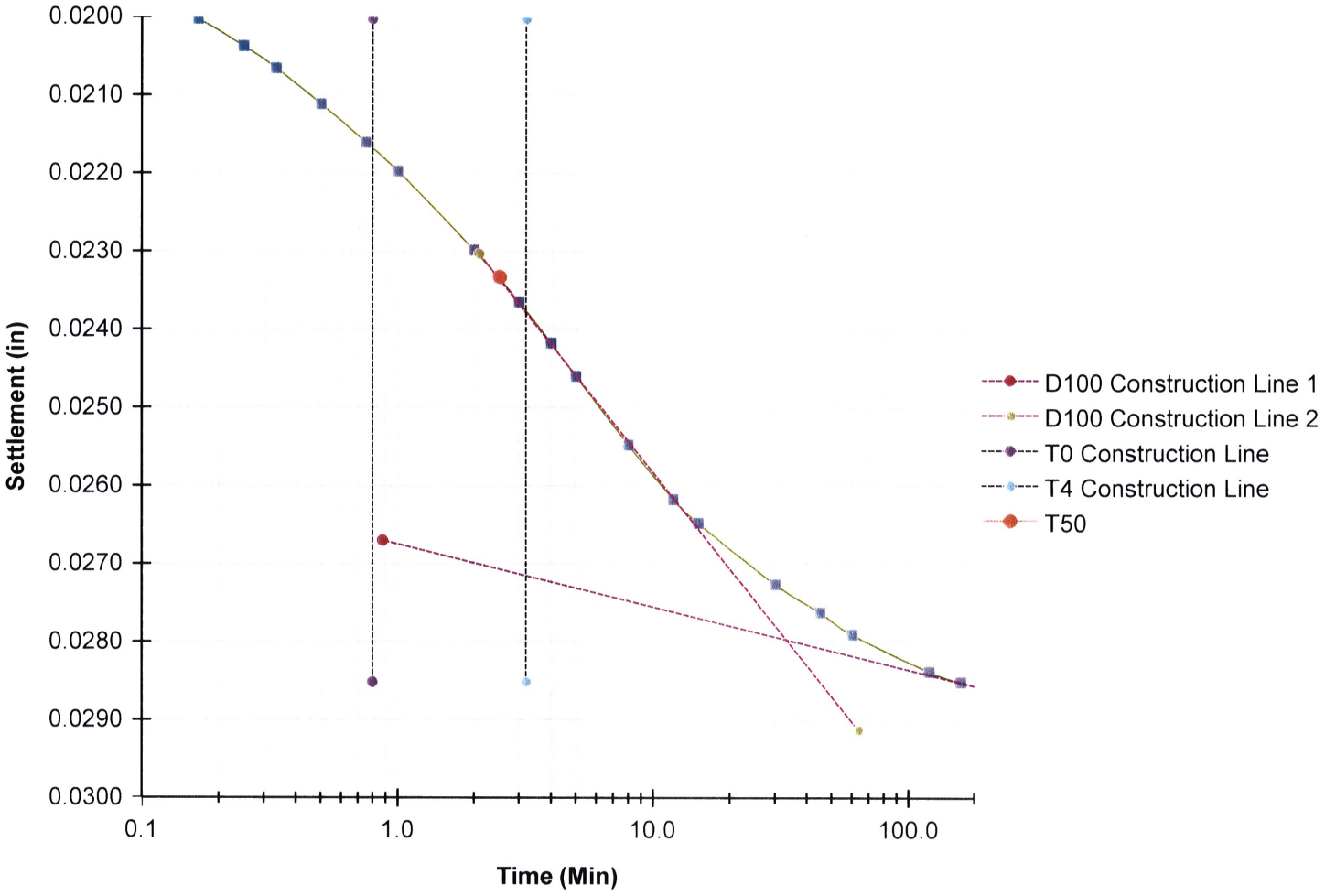
Specimen 1			
Test Description:	Consolidation		
Other Associated Tests:			
Device Details:			
Test Specification:			
Test Time:	2/15/2022 12:00:00 AM		
Technician:		Sampling Method:	
Specimen Code:		Specimen Lab #:	
Specimen Description:	Brown SiltY CLAY		
Specimen Preparation:	Ring-Lined Sampler		
Large Particle:			
Moisture Content:	Natural Moisture		
Test Condition:	Undisturbed		
Test Procedure:			
Seating Pressure Used:	YES	Seating Pressure (tsf):	0.015
Preconsolidation Stress:			
Percent Strain [LOG] Graph (tsf):	NA	Final Voids Graph (tsf):	0.000

Logarithmic Time [1] 0.250 tsf



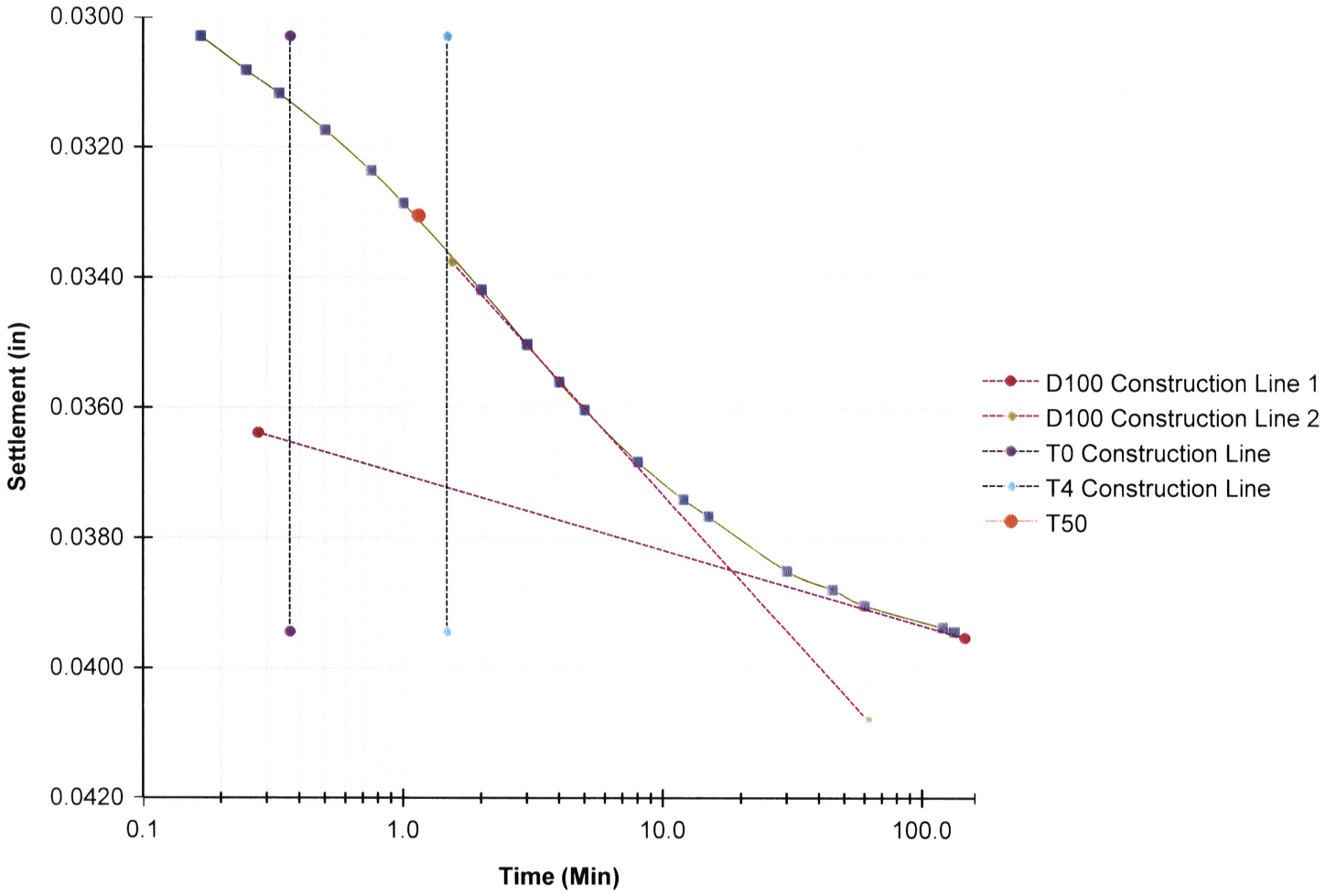
Tangent Construction Results	
T90 (Min)	NA
T50 (Min)	3.471
Cv (in²/Min)	0.0142

Logarithmic Time [2] 0.500 tsf



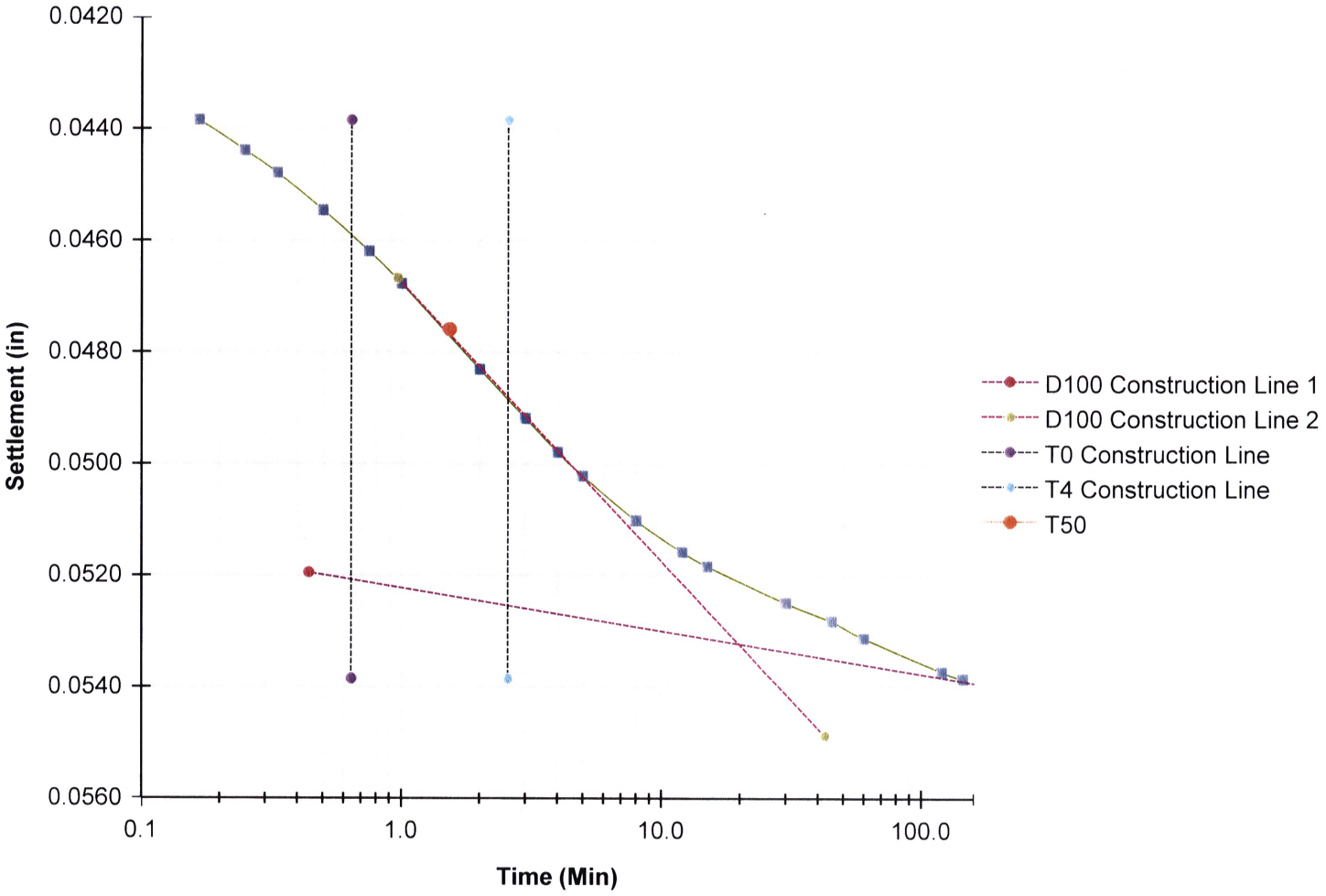
Tangent Construction Results	
T90 (Min)	NA
T50 (Min)	2.518
Cv (in²/Min)	0.0187

Logarithmic Time [3] 1.000 tsf



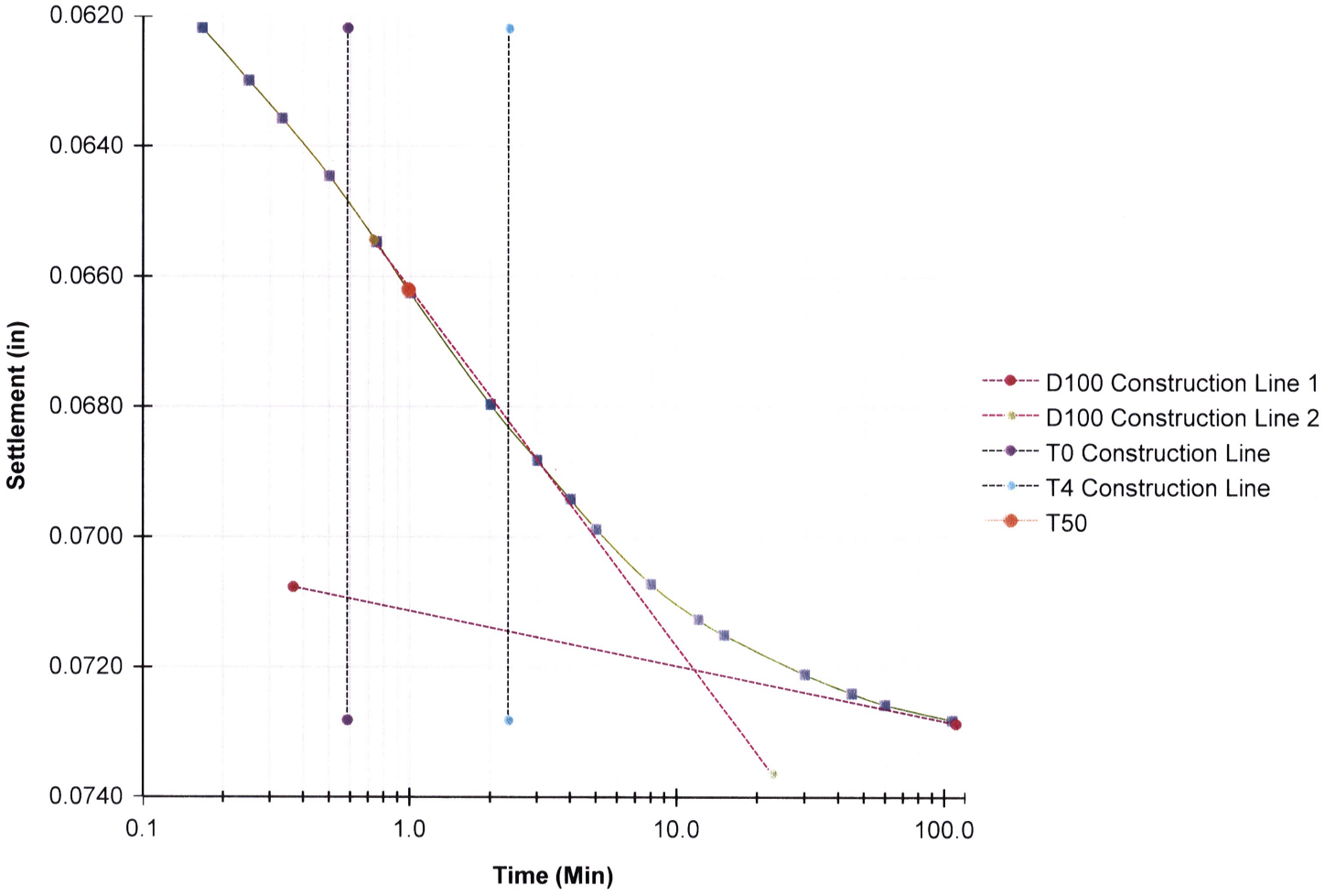
Tangent Construction Results	
T90 (Min)	NA
T50 (Min)	1.144
Cv (in²/Min)	0.0394

Logarithmic Time [4] 2.000 tsf



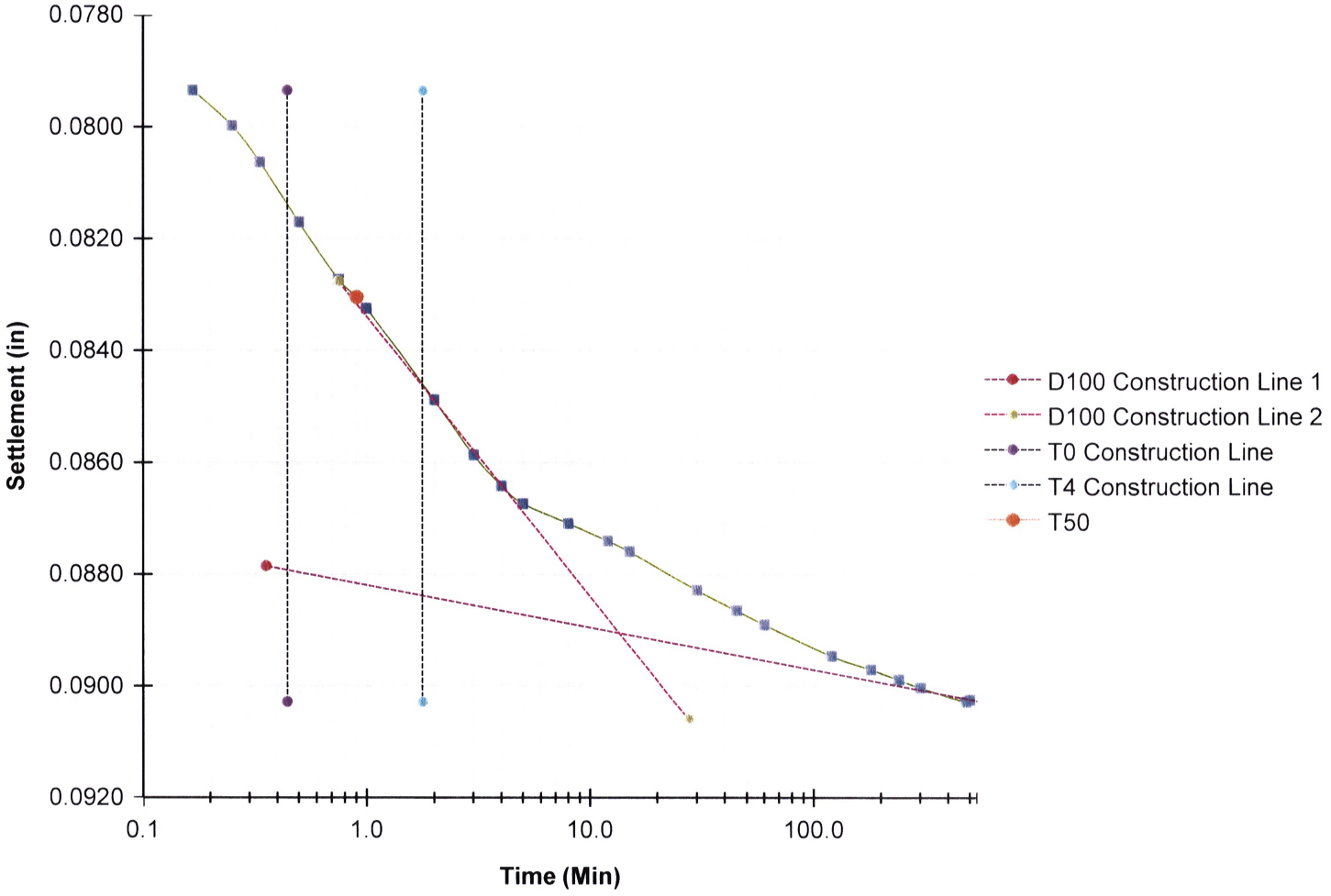
Tangent Construction Results	
T90 (Min)	NA
T50 (Min)	1.532
Cv (in²/Min)	0.0277

Logarithmic Time [5] 4.000 tsf



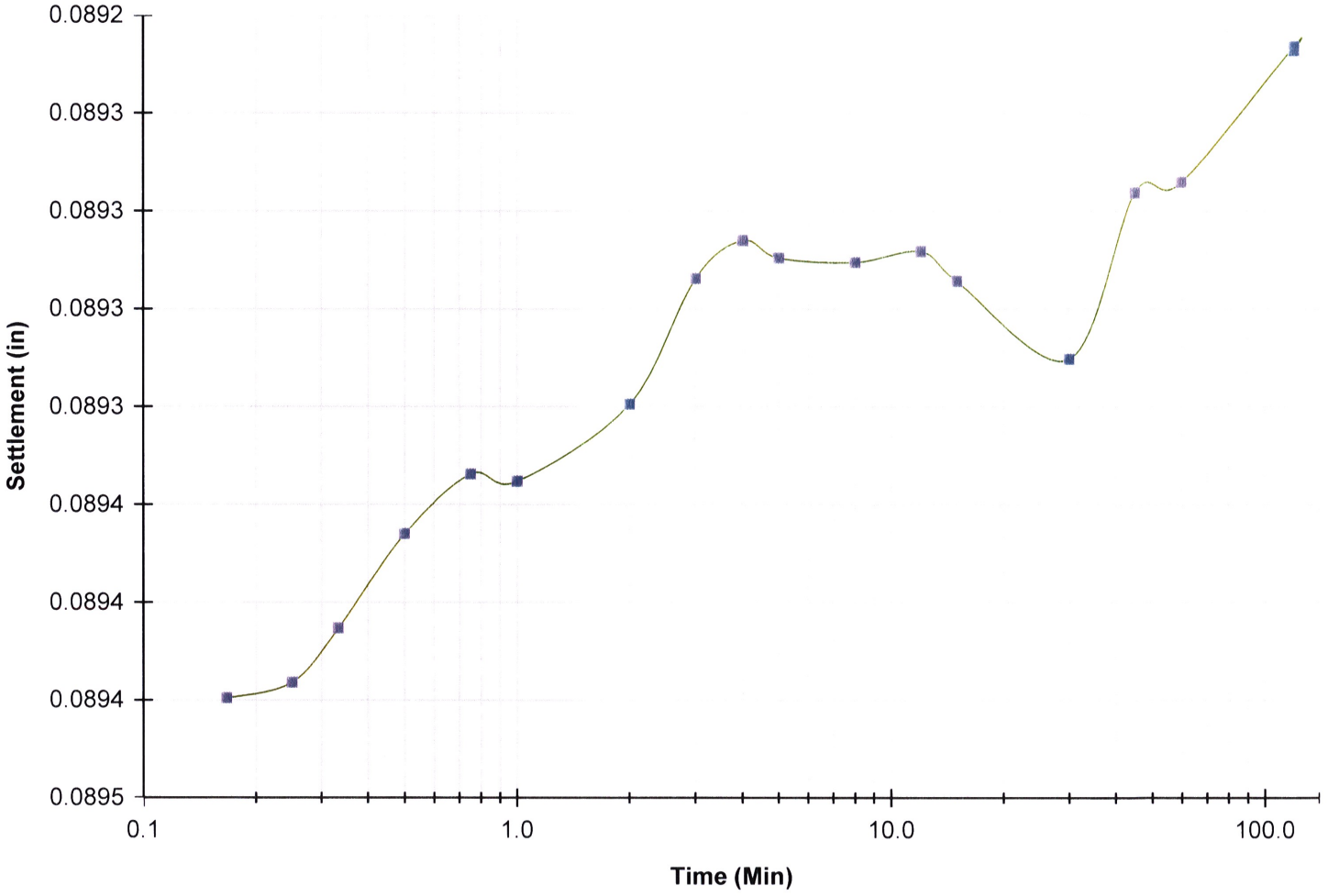
Tangent Construction Results	
T90 (Min)	NA
T50 (Min)	0.985
Cv (in²/Min)	0.0396

Logarithmic Time [6] 8.000 tsf



Tangent Construction Results	
T90 (Min)	NA
T50 (Min)	0.903
Cv (in²/Min)	0.0400

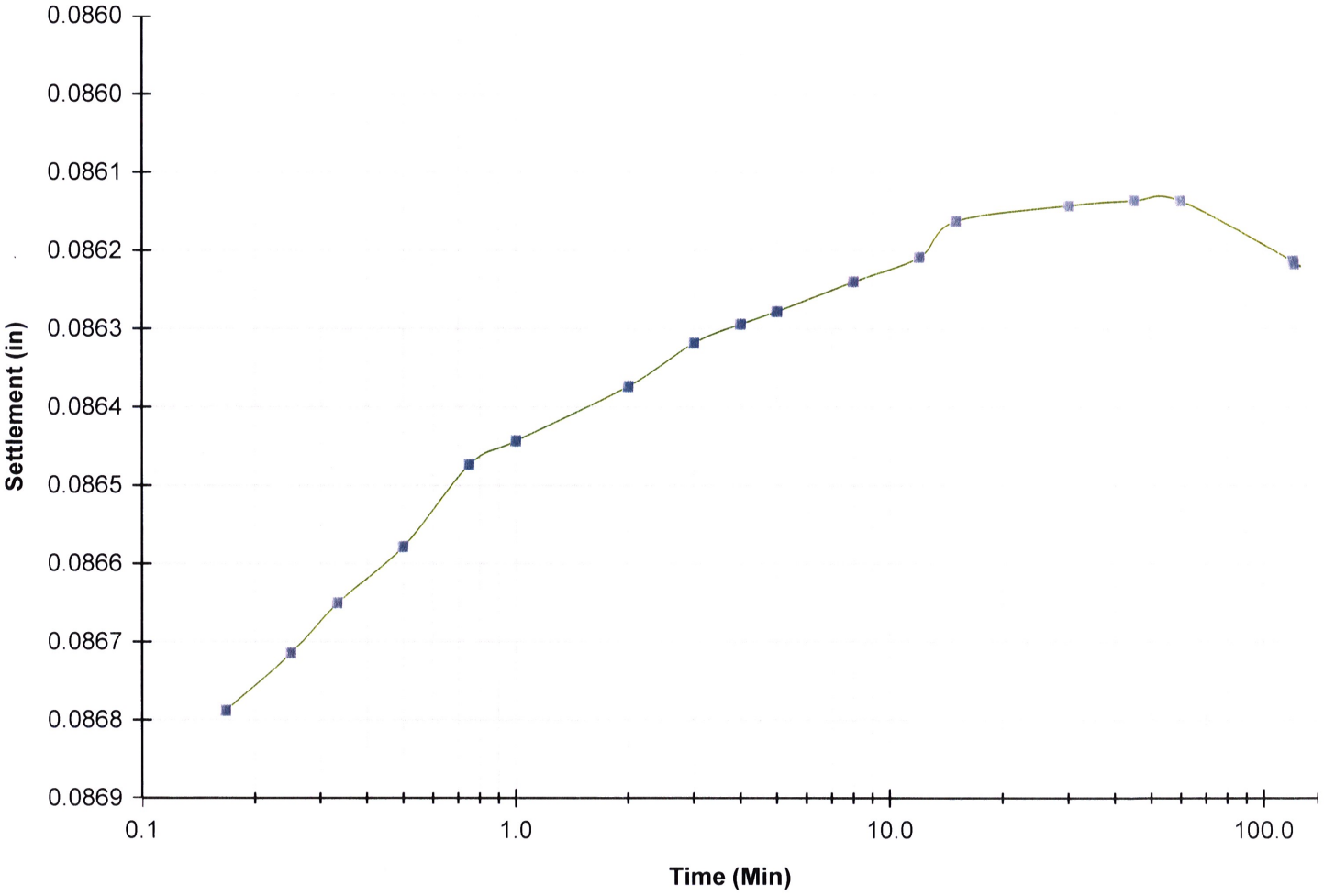
Logarithmic Time [7] 4.000 tsf



Tangent Construction Results	
T90 (Min)	NA
T50 (Min)	NA
Cv (in²/Min)	NA

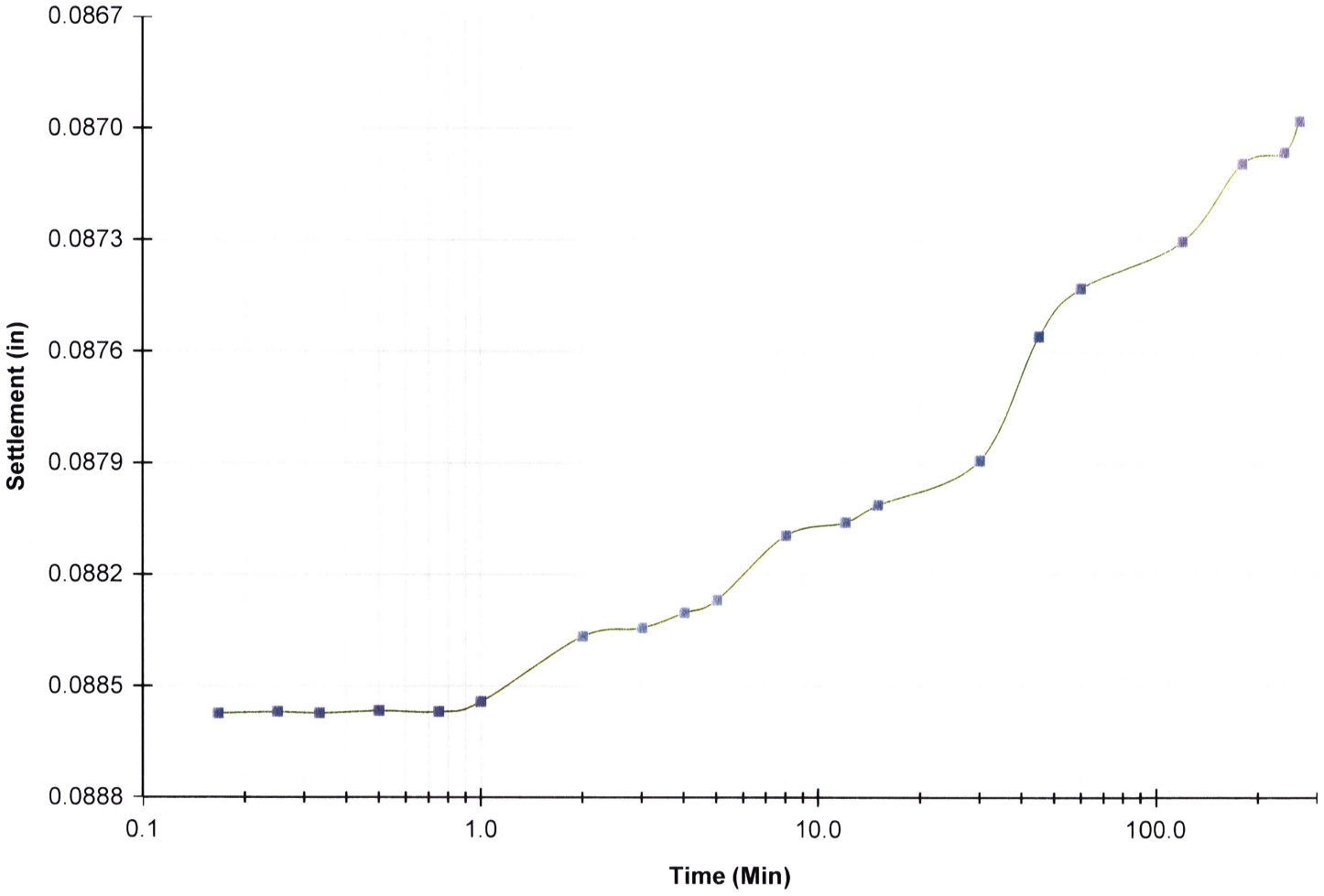
Project Name: Robinson W
Test Date: 2-4o-2022

Logarithmic Time [8] 2.000 tsf



Tangent Construction Results	
T90 (Min)	NA
T50 (Min)	NA
Cv (in²/Min)	NA

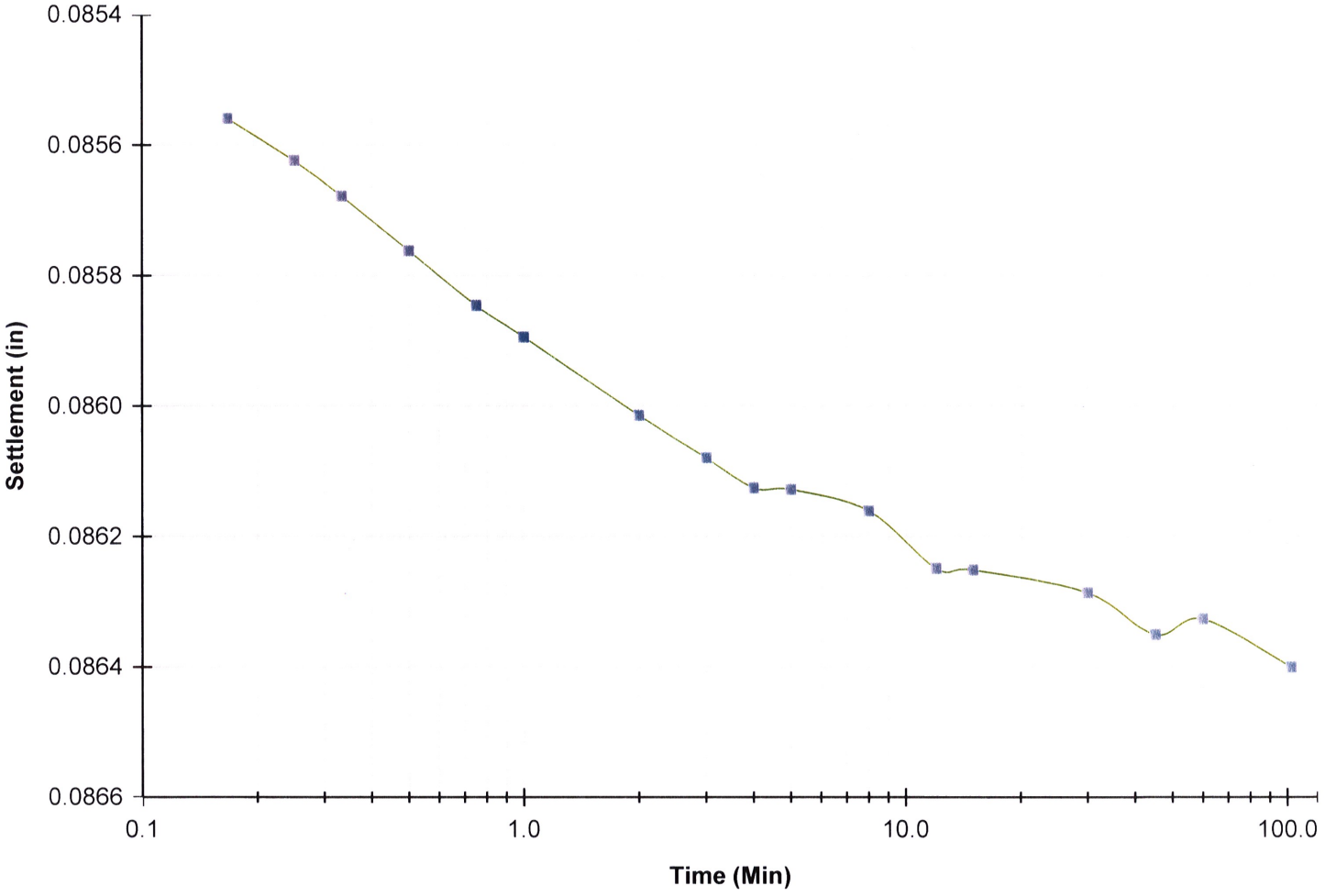
Logarithmic Time [9] 0.250 tsf



Tangent Construction Results	
T90 (Min)	NA
T50 (Min)	NA
Cv (in²/Min)	NA

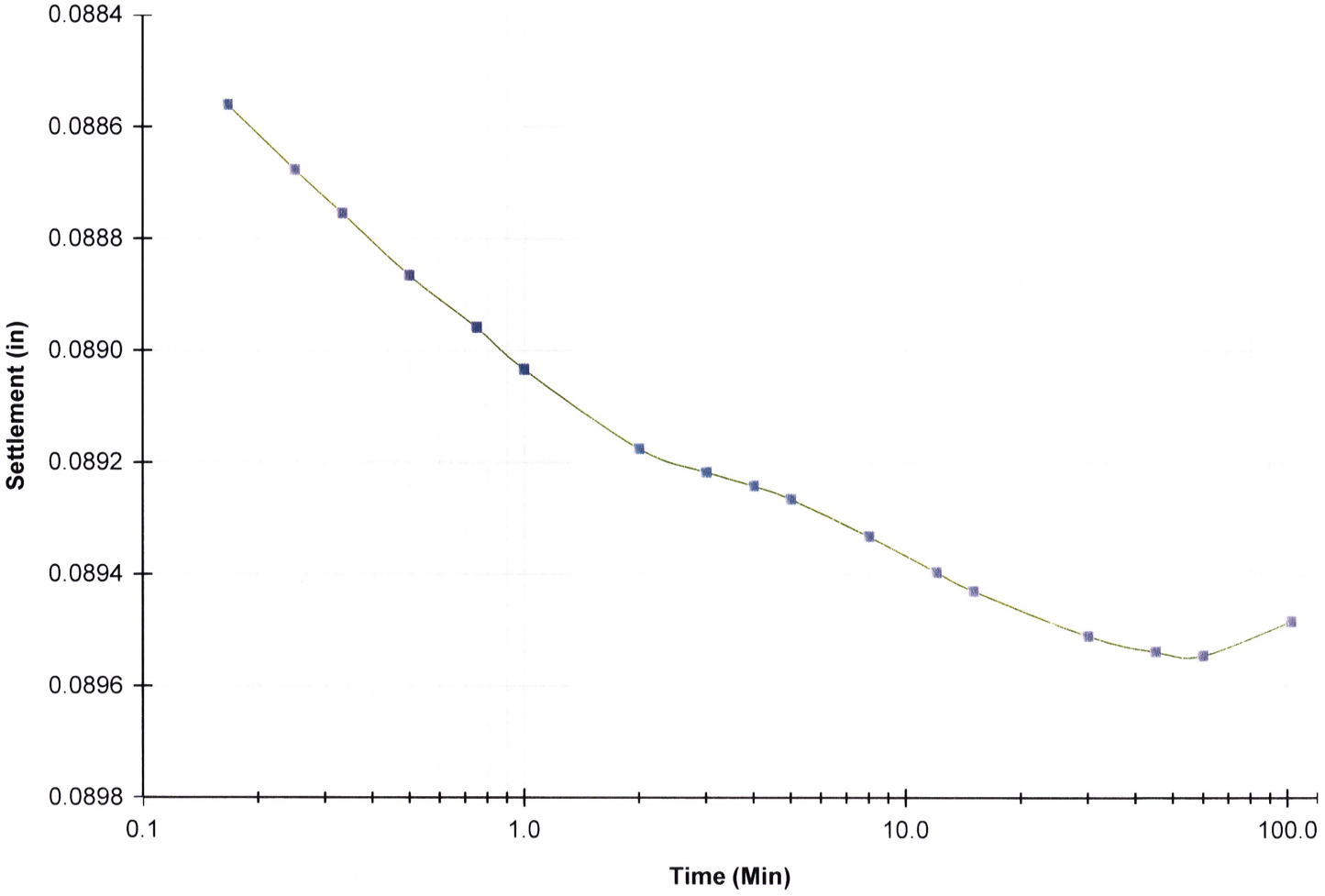
Project Name: Robinson W
Test Date: 2-16-2022

Logarithmic Time [10] 2.000 tsf



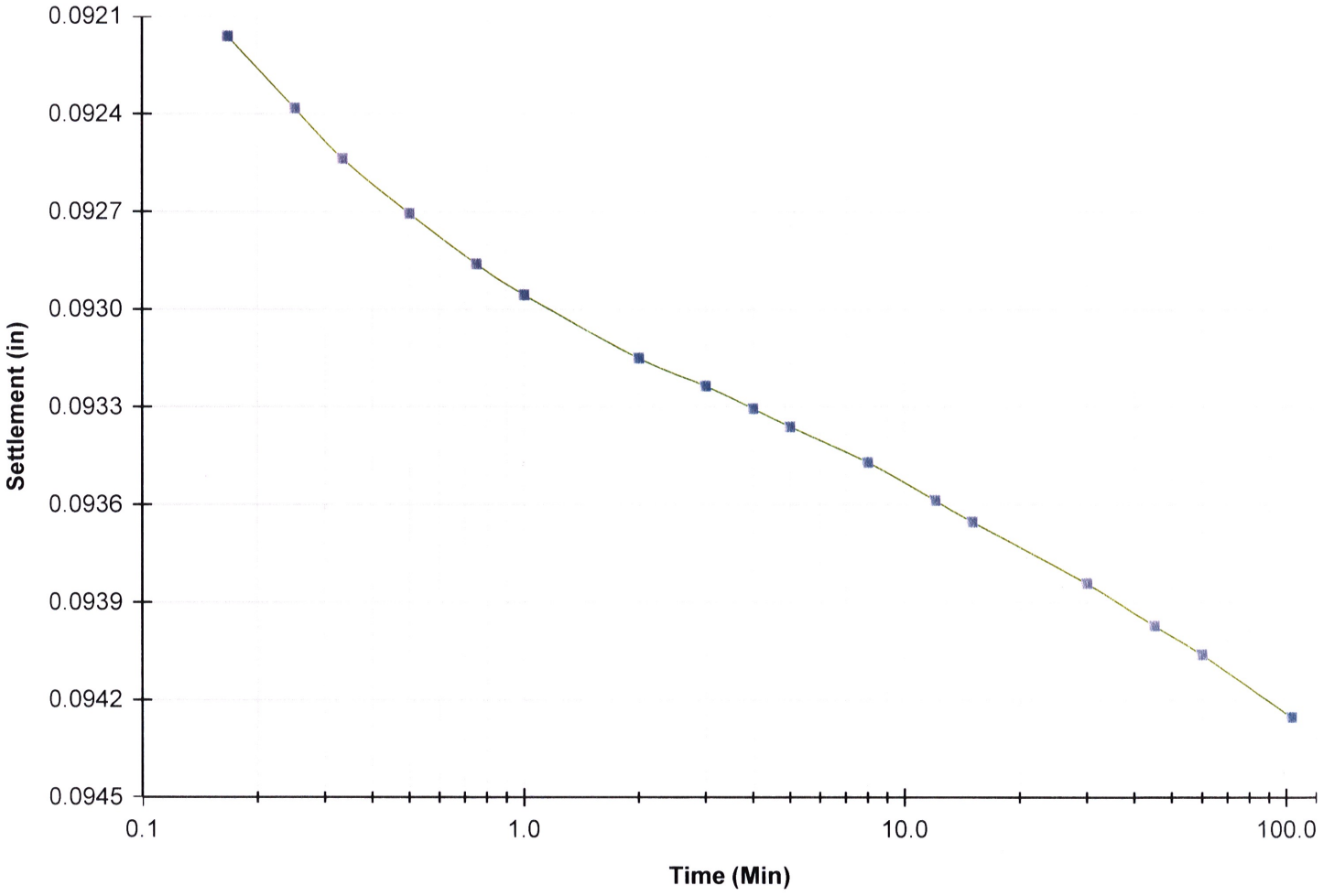
Tangent Construction Results	
T90 (Min)	NA
T50 (Min)	NA
Cv (in^2/Min)	NA

Logarithmic Time [11] 4.000 tsf



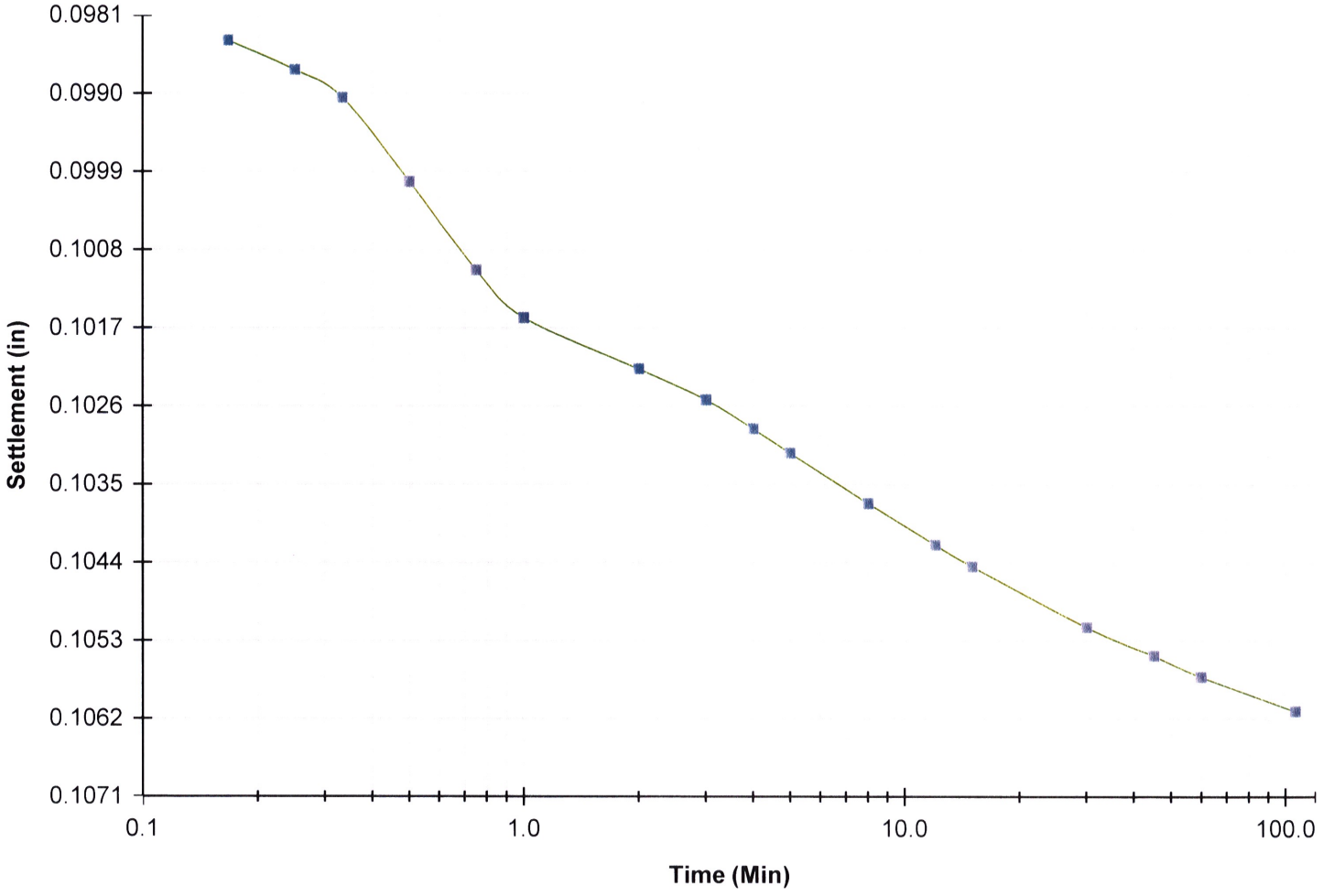
Tangent Construction Results	
T90 (Min)	NA
T50 (Min)	NA
Cv (in²/Min)	NA

Logarithmic Time [12] 8.000 tsf



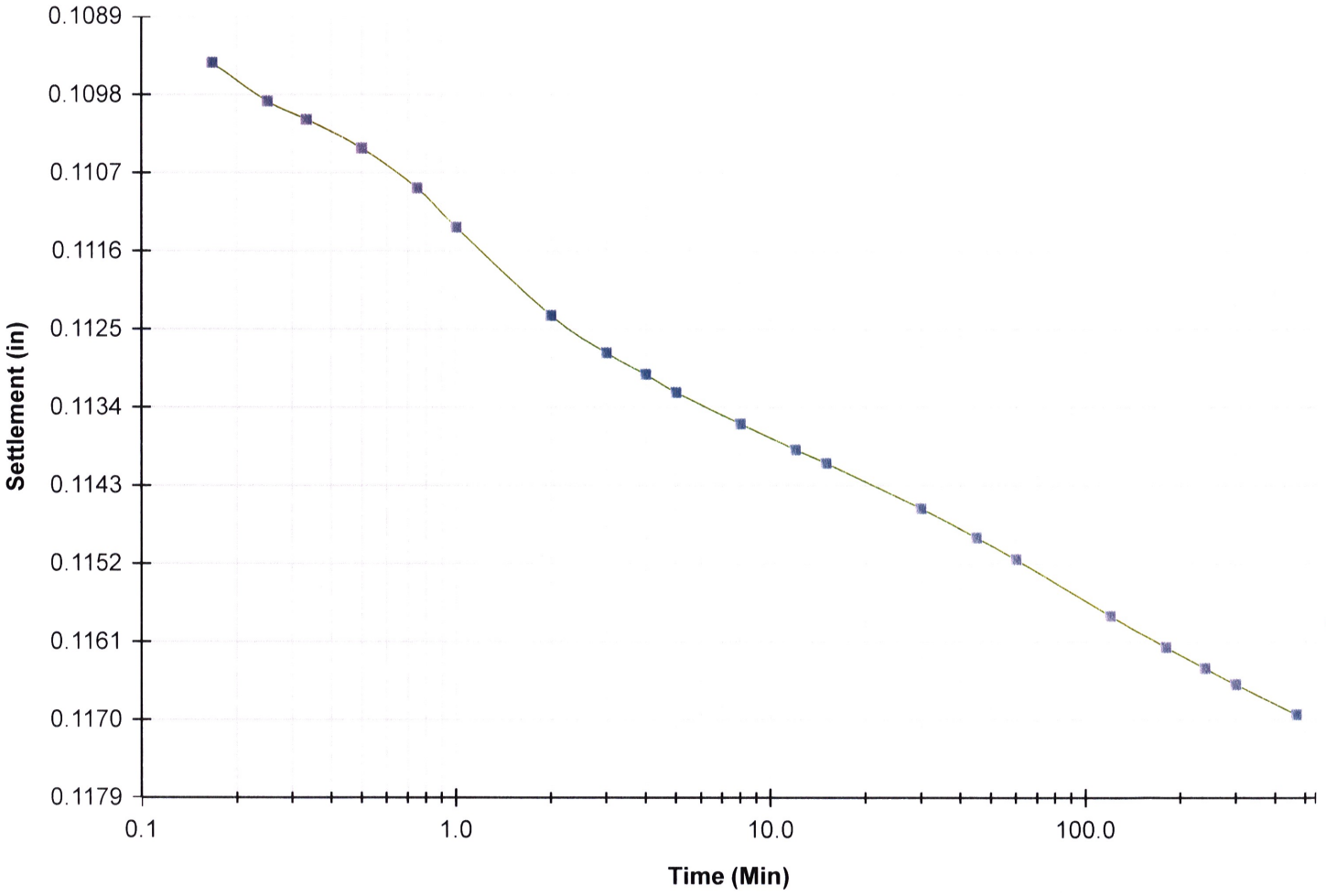
Tangent Construction Results	
T90 (Min)	NA
T50 (Min)	NA
Cv (in²/Min)	NA

Logarithmic Time [13] 16.000 tsf



Tangent Construction Results	
T90 (Min)	NA
T50 (Min)	NA
Cv (in²/Min)	NA

Logarithmic Time [14] 24.000 tsf



Tangent Construction Results	
T90 (Min)	NA
T50 (Min)	NA
Cv (in²/Min)	NA

Hazards by Location

Search Information

Coordinates: 39.01131335635201, -87.68334650993347

Elevation: 480 ft

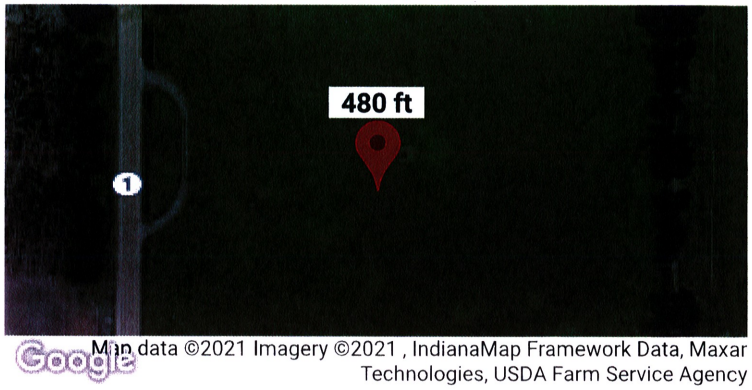
Timestamp: 2021-12-21T17:33:40.626Z

Hazard Type: Seismic

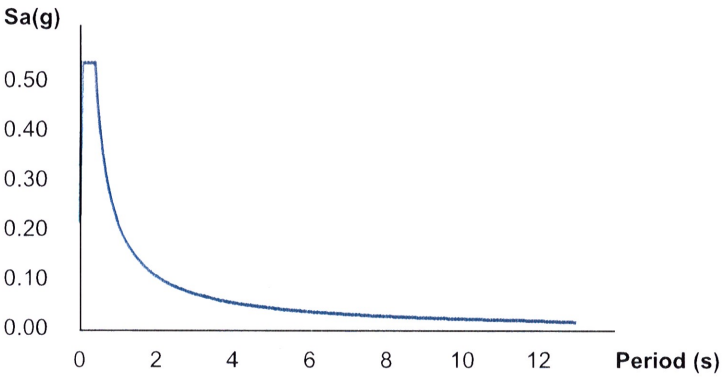
Reference Document: ASCE7-16

Risk Category: I

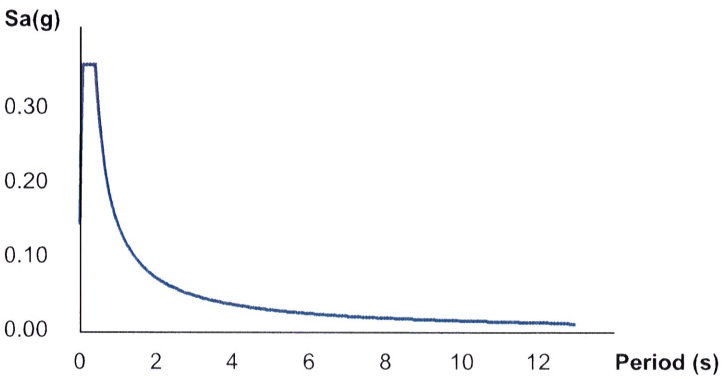
Site Class: C



MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	0.414	MCE_R ground motion (period=0.2s)
S_1	0.144	MCE_R ground motion (period=1.0s)
S_{MS}	0.538	Site-modified spectral acceleration value
S_{M1}	0.216	Site-modified spectral acceleration value
S_{DS}	0.359	Numeric seismic design value at 0.2s SA
S_{D1}	0.144	Numeric seismic design value at 1.0s SA

Additional Information

Name	Value	Description
SDC	C	Seismic design category
F_a	1.3	Site amplification factor at 0.2s
F_v	1.5	Site amplification factor at 1.0s
CR_S	0.954	Coefficient of risk (0.2s)

GENERAL NOTES

SAMPLE INDENTIFICATION

The Unified Classification System is used to indentify the soil unless othwerwise noted.

RELATIVE DENSITY & CONSISTENCY CLASSIFICATION

TERM (NON-COHESIVE SOILS)	BLOWS PER FOOT
Very Loose	0-4
Loose	5-10
Firm	11-30
Dense	31-50
Very Dense	Over 50

TERM (COHESIVE SOILS)	QU (tsf)
Very Soft	0.00- 0.25
Soft	0.25-0.50
Firm	0.50-1.00
Stiff	1.00-2.00
Very Stiff	2.00-4.00
Hard	4.00+

DRILLING & SAMPLING SYMBOLS

ss:	Split Spoon-	1 3/8" I.D., 2" O.D.
st:	Shelby Tube-	2.80" I.D., 3" O.D.
au:	Auger Samples	
cs:	Continuous Sampling	2.0" I.D

SOIL PROPERTY SYMBOLS

●	Unconfined Compressive Strength, Qu (tsf)
+	Penetrometer Value, (tsf)
	Plastic Limit (%)
O	Water Content (%)
	Liquid Limit (%)
X	Standard "N" Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2" O.D. Split Spoon

PARTICLE SIZE

Boulders	8in +	Medium Sand	0.6mm to 0.2mm
Cobbles	8in to 3in	Fine Sand	0.2mm to 0.74 mm
Gravel	3in. to 5mm	Silt	0.074mm to 0.0005mm
Coarse Sand	5mm to 0.6mm	Clay	Less Than 0.005mm

UNIFIED SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS	GW	Well graded gravels, gravel-sand mixtures
			GP	Poorly graded gravels, gravel-sand mixtures
		GRAVELS WITH FINES	GM	Silty gravels, gravels-sand silt mixtures
			GC	Clayey gravels, gravel-sand clay mixtures
		CLEAN SANDS	SW	Well-graded sands, gravelly sands
			SP	Poorly graded sands, gravelly sands
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, clay-sand mixtures
FINE GRAINED SOILS	SILTS AND CLAYS LOW PLASTICITY		ML	Inoganic silts of clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity
	SILTS AND CLAYS HIGH PLASTICITY		OL	Organic silts and organic silty clays of low plasticity
			MH	Inorganic clays of high plasticity
			CH	Organic clays of high plasticity
HIGHLY ORGANIC SOILS			OH	Organic clays of medium to high plasticity
			PT	Peat, humus, swamp soils with high organic contents

EXHIBIT B - IDOT PERMITS

- PERMIT NO. 7D-34586 ROUTE IL 33
- PERMIT NO. 7D-34581 ROUTE IL 1

- PERMIT NO. 7D-34586 ROUTE IL 33

Illinois Department of Transportation

Utility Permit

IDOT Public Improvement ☐ Yes ☒ No

IDOT Permit No. 7D-34586

Utility Reference No. 416D 00 RPWC IL 33

I (We) Name of Applicant: Robinson Palestine Water Commission | E-mail: jason.wesner@frontier.com

Mailing Address: 108 East Poplar Street | City: Robinson | State: IL | Zip Code: 62454

hereinafter termed the Permittee, request permission and authority to occupy, and to do certain work herein described on, the right-of-way of the State highway known as Illinois Rte. 33 - FAP 781, Section 31 - Township 7 North - Range 11 West 102WRS

in Crawford County.

Latitude/Longitude Begin 1017+00 End 1017+50

The work is described in detail below and/or on the attached sketch or plans.

The work includes constructing a 20" finished water main that will cross Illinois Route 33 - FAP Route 781. The 20" will cross Illinois Route 33 - FAP Route 781 along station 20+93 to 21+53 . Work also includes constructing a 20" raw water main that will cross Illinois Route 33 - FAP Route 781. The The 20" water main will cross Illinois Route 33 - FAP Route 781 along station 40+25 to 40+85. This work is a part of the construction of a new water treatment plant.
This work is located east of Robinson IL and east of Gordon Junction approximately 637+/-

This permit covers the operation and presence of specified equipment, material or facility on the right-of-way that may be related to the authorized work. A copy of this permit must be present when crews or equipment occupy highway right-of way. Failure to comply may result in the cessation of all construction.

This permit is subject to conditions and restrictions of Part 530 of Title 92 of the Illinois Administrative Code, Accommodation of Utilities on Right-of-Way of the Illinois State Highway System. The removal, relocation or modification of facilities permitted to occupy the right-of-way is governed by Section 9-113 of the Illinois Highway Code, as amended by Public Act 92-0470. The Permittee agrees to comply with the requirements of these laws and with all terms and conditions established by this permit. This permit is subject to revocation by the Department on violation of the terms and conditions governing its use.

IDOT is accepting the GPS points as an approximation. ROW, dimensions, and GPS are not reviewed for accuracy.
It is the applicant's responsibility to place utilities at the allowable utility corridor line, or as close to ROW line as possible. Utilities can be no farther away from the ROW line than 8'. No utilities are allowed in the sidewalk, shoulder, foreslope, under culverts, or the bottom of the ditch.

All appurtenances must be installed within 1' of the ROW line or corridor line. Hand holes, valves, markers, pedestals, boxes, etc. must be installed flush with the surrounding ground elevation, be heavy-duty, and have a minimum load rating of 20,000 lbs. Tier 15 or 22 depending on the location according to the current IDOT handhole specifications.

Utilities must follow a predictable path and be at a ninety-degree (90°) angle under or over the roadway surface.
All bores will need to be a minimum of 36" under the lowest elevation across the ROW for conventional highways. Utilities need to be installed a minimum of 10' away from culverts.
All disturbed sidewalks must be returned to current A.D.A. Standards. Provided information does not give variance to the permit specifications, standards, and provisions. Variances must be explicitly requested and approved.
ANY VARIATIONS FROM THE POLICY GUIDELINES REQUIRES PRIOR APPROVAL!

Permittee Signature & Date: Jason A. Wesner 10/16/24

Name of Permitee or Agent (Print or Type): Jason Wesner, Manager

Mailing Address: 108 East Poplar Street

City: Robinson | State: IL | Zip Code: 62454

The work authorized by this permit shall be completed by 07/31/25 or within 180 calendar days (180 days max.) after the date of approval by the Department, otherwise the permit will be considered null and void.

Public Improvement Projects only: The anticipated letting date is _____
The permit allowing occupancy and work on state right-of-way is approved. The Utility Coordination Council established by the Department in the area covered by this permit is the district in which the permit was issued.

Regional Engineer or Designee Signature & Date: Jeffrey P Myers 11/14/24

Illinois Department of Transportation

Utility Permit

IDOT Public Improvement ☐ Yes ☒ No

IDOT Permit No. 7D-34586

Utility Reference No. 416D 00 RPWC IL 33

I (We) Name of Applicant: Robinson Palestine Water Commission

E-mail: jason.wesner@frontier.com

Mailing Address: 108 East Poplar Street

City: Robinson

State: IL

Zip Code: 62454

hereinafter termed the Permittee, request permission and authority to occupy, and to do certain work herein described on, the right-of-way of the State highway known as Illinois Rte. 33 - FAP 781, Section 31 - Township 7 North - Range 11 West 102WRS, in Crawford County.

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All bores will need to be a minimum of 36" under the lowest elevation across the ROW for conventional highways. Utilities need to be installed a minimum of 10' away from culverts.
All disturbed sidewalks must be returned to current A.D.A. Standards. Provided information does not give variance to the permit specifications, standards, and provisions. Variances must be explicitly requested and approved.
ANY VARIATIONS FROM THE POLICY GUIDELINES REQUIRES PRIOR APPROVAL!

Permittee Signature & Date: Jason A. Wesner 10/16/24

Name of Permitee or Agent (Print or Type): Jason Wesner, Manager

Mailing Address: 108 East Poplar Street

City: Robinson State: IL Zip Code: 62454

The work authorized by this permit shall be completed by 07/31/25 or within 180 calendar days (180 days max.) after the date of approval by the Department, otherwise the permit will be considered null and void.

Public Improvement Projects only: The anticipated letting date is _____

The permit allowing occupancy and work on state right-of-way is approved. The Utility Coordination Council established by the Department in the area covered by this permit is the district in which the permit was issued.

Regional Engineer or Designee Signature & Date

This permit is subject to the conditions and restrictions **established in accordance with the Illinois Highway Code and** Part 530 of Title 92 of the Illinois Administrative Code including but not limited to the following:

(1) The applicant represents all parties in interest and shall furnish material, do all work, pay all costs and shall in a reasonable length of time restore the damaged portions of the highway to a condition similar or equal to that existing before the commencement of the described work, including any landscape restoration necessary. (See Section 530.250 of Title 92).

(2) The proposed work shall be located and constructed to the satisfaction of the Regional Engineer or his duly authorized representative. No revisions or additions shall be made to the proposed work on the right-of-way without the written permission of the Regional Engineer or his duly authorized representative (See Section 530.200 of Title 92). **In certain circumstances the Department may require that the construction plans and/or the as-built documents be sealed by an Illinois Registered Professional Engineer.** Typical of such projects would be petroleum or gas pipelines.

(3) The applicant shall at all times conduct the work in such a manner as to minimize hazards to vehicular and pedestrian traffic. All signs, barricades, flaggers, etc., required for traffic control shall be furnished by the applicant. (See Section 530.240 of Title 92).

(4) The applicant must ascertain the presence of Highway Authority Agreements established in accordance with 35 Ill. Admin. Code Section 742.1020 in the path of its proposed installation and take precautions to protect its workers, human health and the environment in those areas. (See Section 530.240 of Title 92). Where contamination is encountered through excavation in the ROW, it should be managed offsite and IDOT's generator number for the appropriate county may be used.

(5) The applicant shall not trim, cut or in any way disturb any trees or shrubbery along the highway without the approval of the Regional Engineer or his duly authorized representative. (See Section 530.600 of Title 92).

(6) The facilities authorized to occupy the right-of-way by this permit are subject to removal, relocation or modification by the permittee at no expense to the State on notice given by the Department in accordance with Section 9-113 of the Illinois Highway Code, as amended. Participation by the permittee in the UTILITY Coordination Council identified on page one of this permit is required as a condition of this permit. Permittee shall cooperate with the Department with the scheduling of any removal, relocation or modification deemed necessary for highway or highway safety purposes, and, if Utility Coordination Council participation is required by this permit, with the activities of the council identified on the first page of this permit. (See Section 9-113 of the Illinois Highway Code.) Use of and compliance with current IDOT Traffic Control Standards will be required.

(7) If the applicant and the District cannot agree either on whether the permit should be issued or on what conditions would be appropriate, the applicant may, within 30 days of the issuance of written notice of the District's position, appeal the District's determination to the Chief of the Department's Central Bureau of Operations. (See Section 530.900 of Title 92).

(8) The permittee agrees to fully comply with the following legal obligations in advance of entering and while upon any Right-of-way within the Illinois State Highway System.

a) Only a permit issued by the Department under this Part will satisfy the "written consent" requirement of Section 9-113 of the Illinois Highway Code (the Code).

b) A permit from the Department grants a license only to undertake certain activities in accordance with this Part on a State right-of-way, and does not create a property right or grant authority to the permittee to impinge on the rights of others who may have an interest in the right-of-way. Such others might include an owner of an underlying fee simple interest if the right-of-way is owned as an easement or dedication of right of way, an owner of an easement, or another permittee.

c) It shall be the responsibility of the permittee to ascertain the presence and location of existing above-ground or underground facilities on the highway right-of-way to be occupied by their proposed facilities. The Department will make its permit records available to a permittee for the purpose of identifying possible facilities. When notified of an excavation or when requested by the Department, a permittee shall locate, physically mark, and indicate the depth of its underground facilities within 48 hours excluding weekends and holidays.

d) The permittee shall avoid conflicts with any existing underground or above-ground facilities on or near the highway right-of-way. Both the Department and J.U.L.I.E. are to be contacted for assistance during the application process.

e) The permittee shall comply with all other applicable laws relating to the placement of utility lines.

f) The issuance of a utility permit by the Department does not excuse the permittee from complying with any existing statutes, local regulations or requirements of other Department (e.g., oversize and overweight vehicles) or the requirements of other State agencies including, but not limited to, the following:
Illinois Commerce Commission, Illinois Department of Agriculture
Illinois Department of Natural Resources, Illinois Department of Mines and Minerals
Illinois Environmental Protection Agency, Illinois Historic Preservation Agency

g) Rights of abutting and underlying property owners are protected by common law and Sections 9-113 and 9-127 of the Code. The permittee will address these rights prior to initiating activities on State right-of-way. The Department will not be a party in any negotiations between the utility and abutting property owners.

h) In no case shall the permit give or be construed to give an entity any easement, leasehold or other property interest of any kind in, upon, under, above or along the State highway right-of-way.

i) Each person responsible for a utility, in place on the effective date of this Part, on a State highway right-of-way shall notify the Department in writing, if that facility does not comply with this Part. The Department shall treat such a notice as a request for a variance under Section 530.130. Until informed that a variance will not be granted, a person responsible for a pre-existing utility will not be in violation of this Part. The failure to provide such notice constitutes a violation of this Part and of the utility accommodation permit (if any) and would justify the imposition of the sanctions set forth in Section 530.810.

Work to be coordinated with Department Reps:

Department Rep 1	Phone
Elly Osborne **(Utility Permits)** Office Phone 217- 342-8310	Cell Phone 217-246-4070
Department Rep 2	**Phone**
Patrick Kennedy **(Utility Permits)** Office Phone 217- 342-8338	Cell Phone 217-836-4250
Utility Contact Person/E-mail	**Phone**

Work to be done by:

Contractor

Daytime Phone	Emergency Phone

Traffic control operation:

Number of lane closures	Time of closures

PERMIT STATUS SHEET 2024

Reference Number: 416D

Permit Number: 7D-34586 Date: _____

County: Crawford Route: IL 33

(CHECK ONE)

*** To be completed when requesting an extension.**

☐ Complete and ready for inspection. Date completed: _____

☐ Proposed work cancelled.

☐ Work started, but incomplete. Requesting an extension of time until: _____

☐ Time extension requested until: _____

*Reason for Extension: _____

_____

_____

Was the permit completed to permit specifications? ☐ Yes ☐ No

If no, please submit as-built plans with status sheet.

Do not request an inspection until a grass turf has been re-established and all necessary paperwork (as-built plans) have been returned.

Name: _____ _____
Representative Phone Number

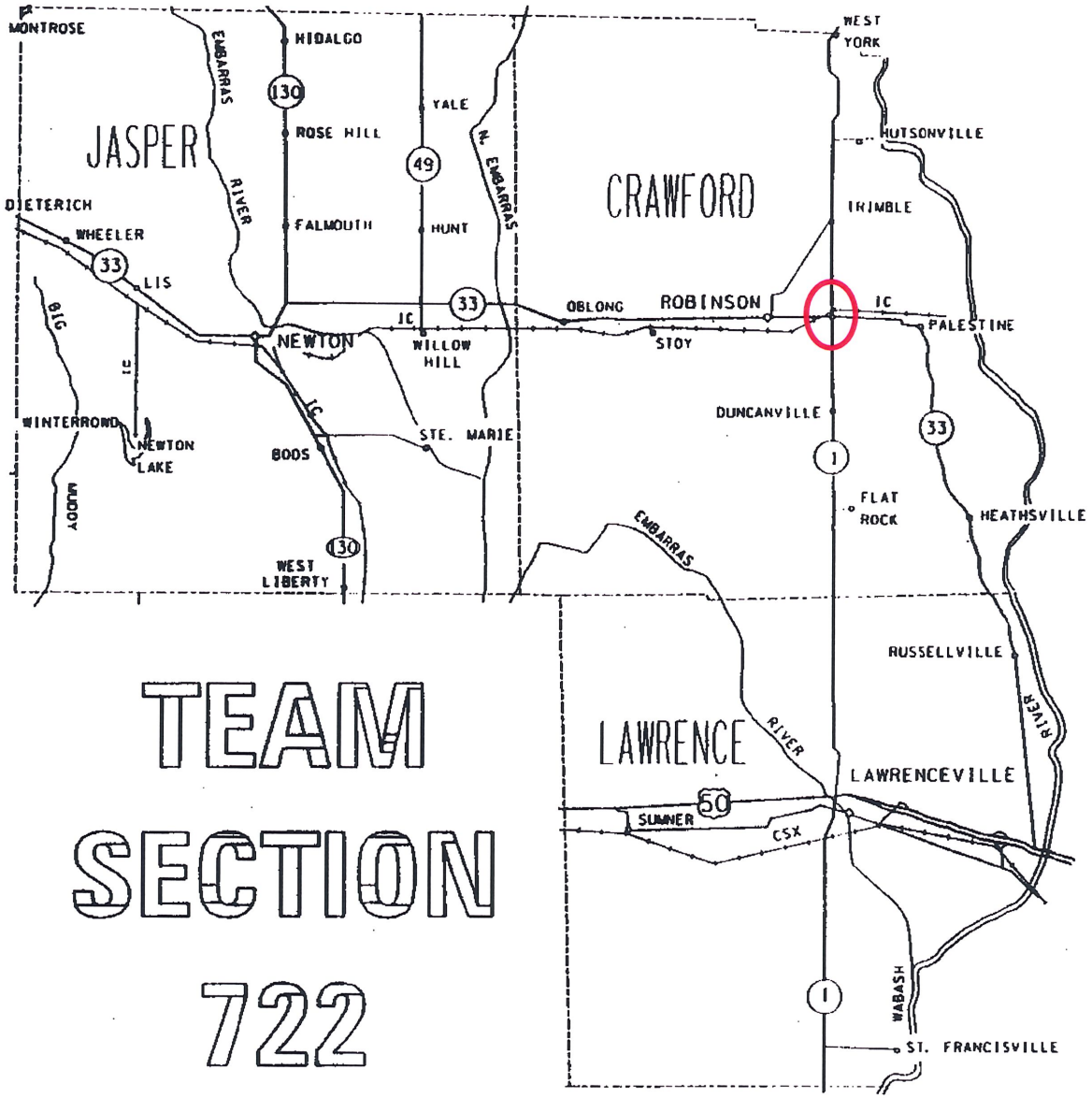
Change of Address: _____
(if applicable) Street Address

_____ _____ _____
City State Zip

PLEASE FILL OUT AND RETURN TO:

Mail: Illinois Department of Transportation
Utility Permits Unit
400 West Wabash Avenue
Effingham, Illinois 62401

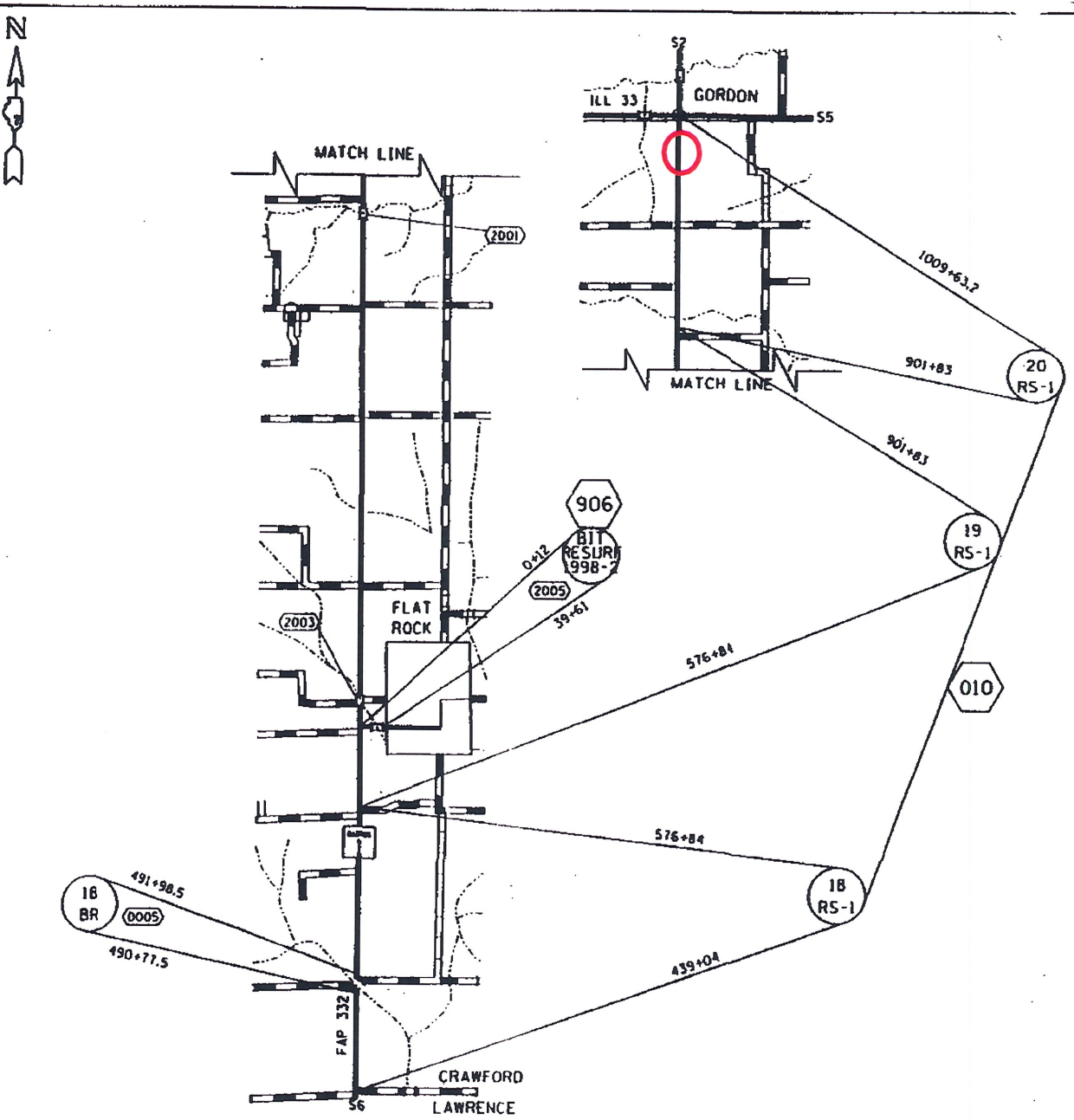
E-mail: Dot.D7.Permits@illinois.gov



TEAM SECTION 722

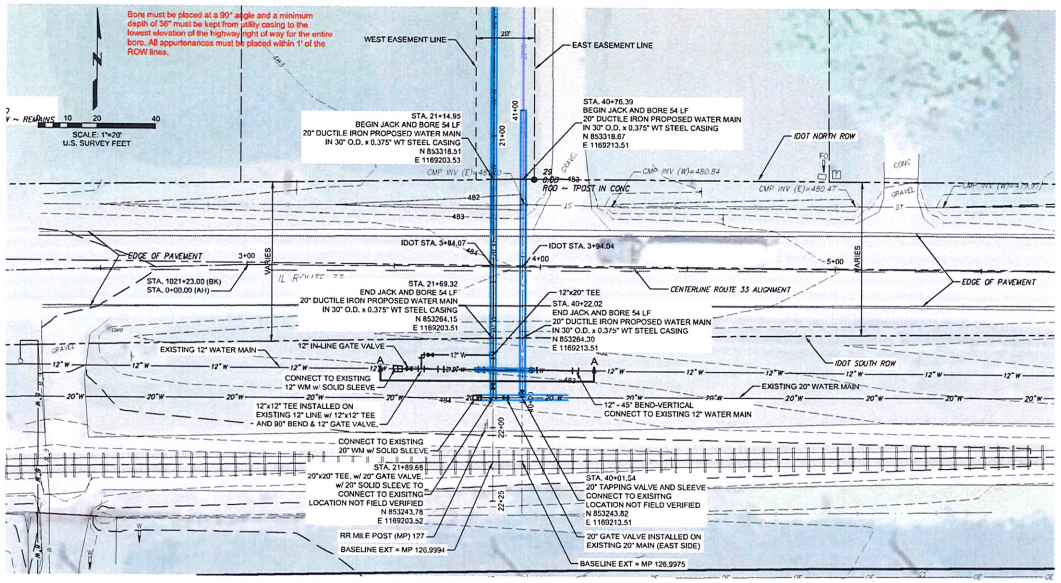
DISTRICT 7 MAINTENANCE TEAM SECTION 722

LINED DATE	CONSTRUCTED AS ROUTE	SECTION	YEAR	SLAB SECTION	WIDTH	SUB-SECTION	CENTERLINE MILES	MICRO-FILM
2251								
ILL 1	SBI 1	20-RS-1	1988	9"-6"-9" 5" I-11	24'	010	2.0417	7-5
ILL 1	SBI 1	19-RS-1	1988	9"-6"-9" 5" I-11	24'	010	6.1551	7-5
ILL 1	SBI 1	18-RS-1	1988	9"-6"-9" 5" I-11	24'	010	2.5383	7-4
LL. 1	SBI 1	18-BR	1963	16"	30'	010	0.0229	7-4
	SBI 136	BIT RESURF 1998-2	1998	9"-6"-9" S 1/4" CL I	18'	906	0.7356	1-60
				TOTAL THIS SHEET			11.4936	
REVISED				COUNTY			CL MILES	
Mar-01								



COUNTY CODE 01

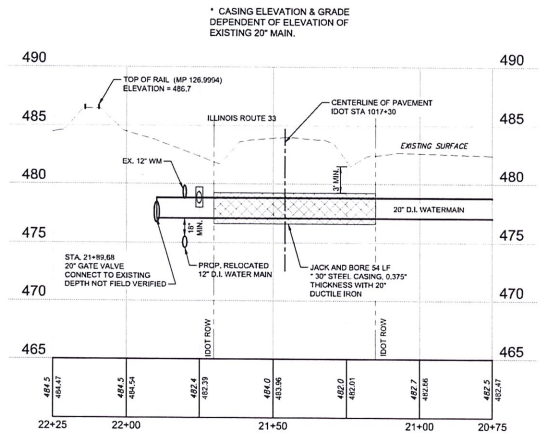
SHEET NO. 1 MAINTENANCE TEAM SECTION 722



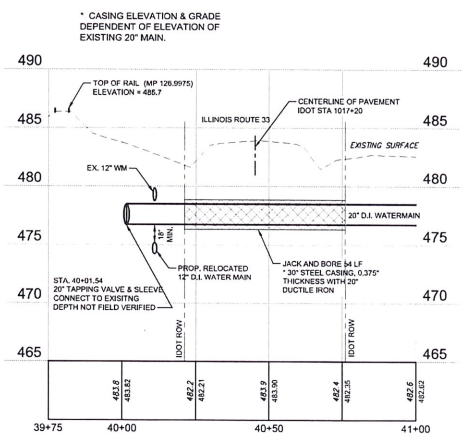
1 PROPOSED WATER MAIN PLAN

SCALE: 1"=20'

NORTH



20" WATER MAIN - STA. 20+50 TO STA. 21+66



20" WATER MAIN - STA. 40+00 TO STA. 41+00

ILLINOIS ROUTE 33 - 20" WATER MAIN CROSSINGS

1 PROPOSED WATER MAIN PROFILE

SCALE: H 1"=20' V 1"=5'

NORTH

NOTES:

1. CONTRACTOR SHALL COMPLETE WORK IN ACCORDANCE WITH IDOT REQUIREMENTS AND PERMIT.
2. THE STANDARD SPECIFICATIONS FOR WATER AND SEWER MAIN CONSTRUCTION IN ILLINOIS 8TH EDITION SHALL APPLY TO THIS WORK.
3. WATER SUPPLIES SHALL BE PROTECTED PER SECTION 370.350 OF THE ILLINOIS RECOMMENDED STANDARDS FOR SEWAGE WORKS.
4. HORIZONTALLY DIRECTIONALLY DRILLED WATER MAIN PIPE SHALL BE DUCTILE IRON PIPE: ANSI/AWWA C151/A21.51 CLASS 250 OR APPROVED EQUAL WITH MINIMUM PRESSURE RATING OF 250 PSI AND MINIMUM WALL THICKNESS OF 1.60 AS PER SPECIFICATION.
5. WATER MAIN SHALL BE PRESSURE TESTED WITH WATER AT 100 PSI FOR ONE HOUR WITHOUT LEAKAGE.
6. CONTRACTOR SHALL POTHOLE ALL UTILITIES PRIOR TO START OF WORK TO VERIFY LOCATION AND ELEVATION.
7. CONTRACTOR RESPONSIBLE FOR DETERMINING SUB SOIL CONDITION PRIOR TO BIDDING AND MAKING CONSIDERATION IN THE BID FOR SUCH.
8. DEVIATION FROM DRILL PATH SHALL NOT EXCEED 5% OF PLAN DEPTH OVER A 100' DISTANCE.
9. ALL MECHANICAL JOINTS SHALL BE RESTRAINED.
10. ABANDONED PIPE TO BE CAPPED AND GROUTED.

ILLINOIS DEPARTMENT OF TRANSPORTATION REQUIREMENTS:

HORIZONTALLY DIRECTIONAL DRILL THE FOLLOWING REQUIREMENTS MUST BE MET:

- PROVIDE SITE-SPECIFIC BORING DATA OR CONE PENETROMETER TESTING WHICH INCLUDES THE SOIL CLASSIFICATION AND BEARING CAPACITY OF THE SOIL IN THE DRILLING LOCATION.
- PROVIDE A CROSS SECTION AND SUMMARY OF THE DIRECTIONAL BORING PROCESS PROPOSED, INCLUDING PILOT HOLE SIZE, ANTICIPATED OVERBORE DIAMETER, RELIEF HOLE LOCATIONS AND THE NUMBER OF PASSES ANTICIPATED TO ENLARGE THE PILOT HOLE TO THE NECESSARY OVERBORE DIAMETER.
- PROVIDE INFORMATION ON THE REAMING MACHINE AND DRILLING FLUID/MUD MIXTURE PROPOSED FOR USE AT EACH DRILLING LOCATION.

FURTHER, DURING INSTALLATION, WE REQUEST THAT THE FOLLOWING GUIDELINES BE FOLLOWED:

- IDOT SHALL BE NOTIFIED A MINIMUM OF TWO (2) WEEKS PRIOR TO COMMENCEMENT OF WORK AND SHALL BE PROVIDED WITH APPROXIMATE WORK DATES.
- A 6-INCH PILOT HOLE IS REQUIRED FOR ALL DIRECTIONAL BORING.
- DIRECTIONAL BORES IN EXCESS OF THE 6 INCH PILOT HOLE SHALL BE ENLARGED USING MULTIPLE PASSES.
- BACKREAMING OF THE BORE IS REQUIRED.
- OVERBORE SHALL BE 25-50% GREATER THAN THE CASING OR CARRIER PIPE DIAMETER.
- RELIEF HOLES ARE REQUIRED.

JACK AND BORE THE FOLLOWING REQUIREMENTS MUST BE MET:

- IDOT SHALL BE NOTIFIED A MINIMUM OF TW0 (2) WEEKS PRIOR TO COMMENCEMENT OF WORK AND SHALL BE PROVIDED WITH APPROXIMATE WORK DATES
- BORE PITS MUST BE A MINIMUM OF 10' PLUS THE DEPTH OF THE PIT AWAY FROM THE EDGE OF PAVEMENT.
- CONTRACTOR SHALL POTHOLE ALL UTILITIES PRIOR TO START OF WORK TO VERIFY LOCATION AND ELEVATION.
- CONTRACTOR RESPONSIBLE FOR DETERMINING SUB SOIL CONDITION PRIOR TO BIDDING AND MAKING CONSIDERATION IN THE BID FOR SUCH.
- DEVIATION FROM DRILL PATH SHALL NOT EXCEED 5% OF PLAN DEPTH OVER A 100' DISTANCE.
- ALL MECHANICAL JOINT SHALL BE RESTRAINED.

Farnsworth GROUP
400 WEST JEFFERSON, SUITE A
FFFINGHAM, ILLINOIS 62401
(217) 531-1253 / info@f-w.com
www.f-w.com
Engineers | Architects | Surveyors | Scientists

#	DATE	DESCRIPTION

PERMIT REVIEW
NOT FOR CONSTRUCTION

PROJECT
Robinson-Palestine Water Commission

Water Treatment Plant and Campus

10711 N. State Highway 1
Robinson, IL 62454

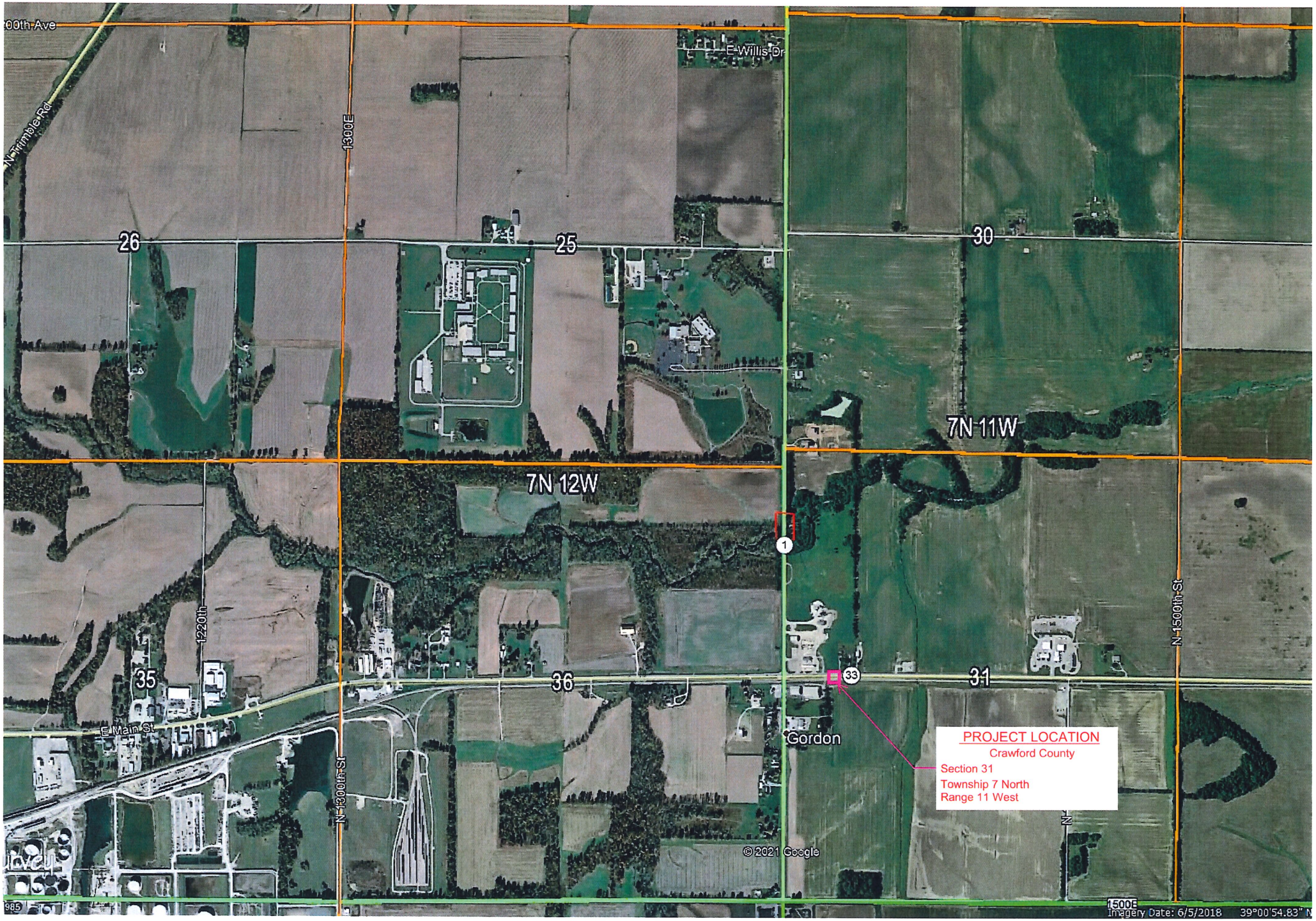
DATE:	10/04/2024
DESIGNED:	ACH
DRAWN:	GAB/BMH
REVIEWED:	ACH
FIELD BOOK NO.:	-

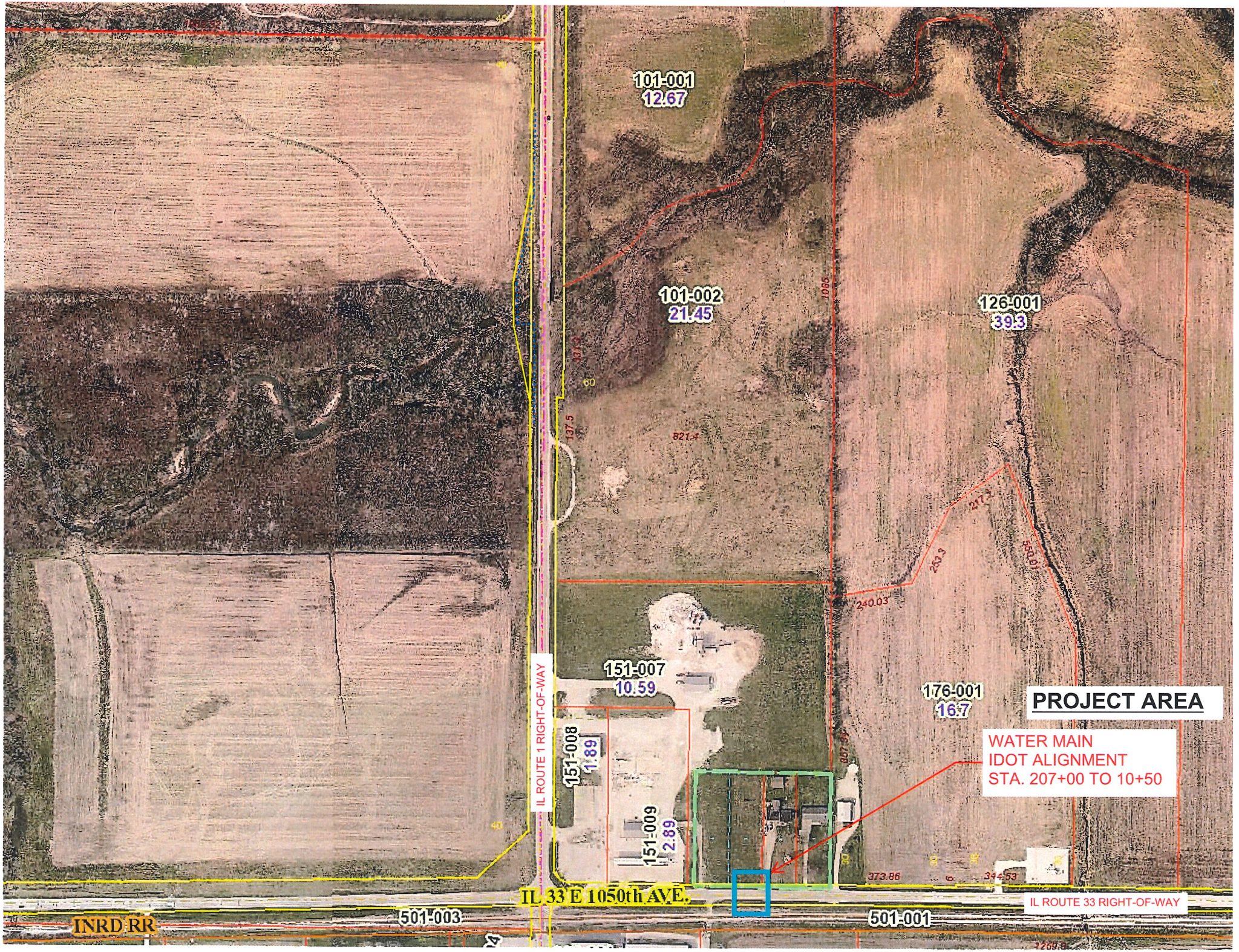
SHEET TITLE:
WATER MAIN PLAN & PROFILE

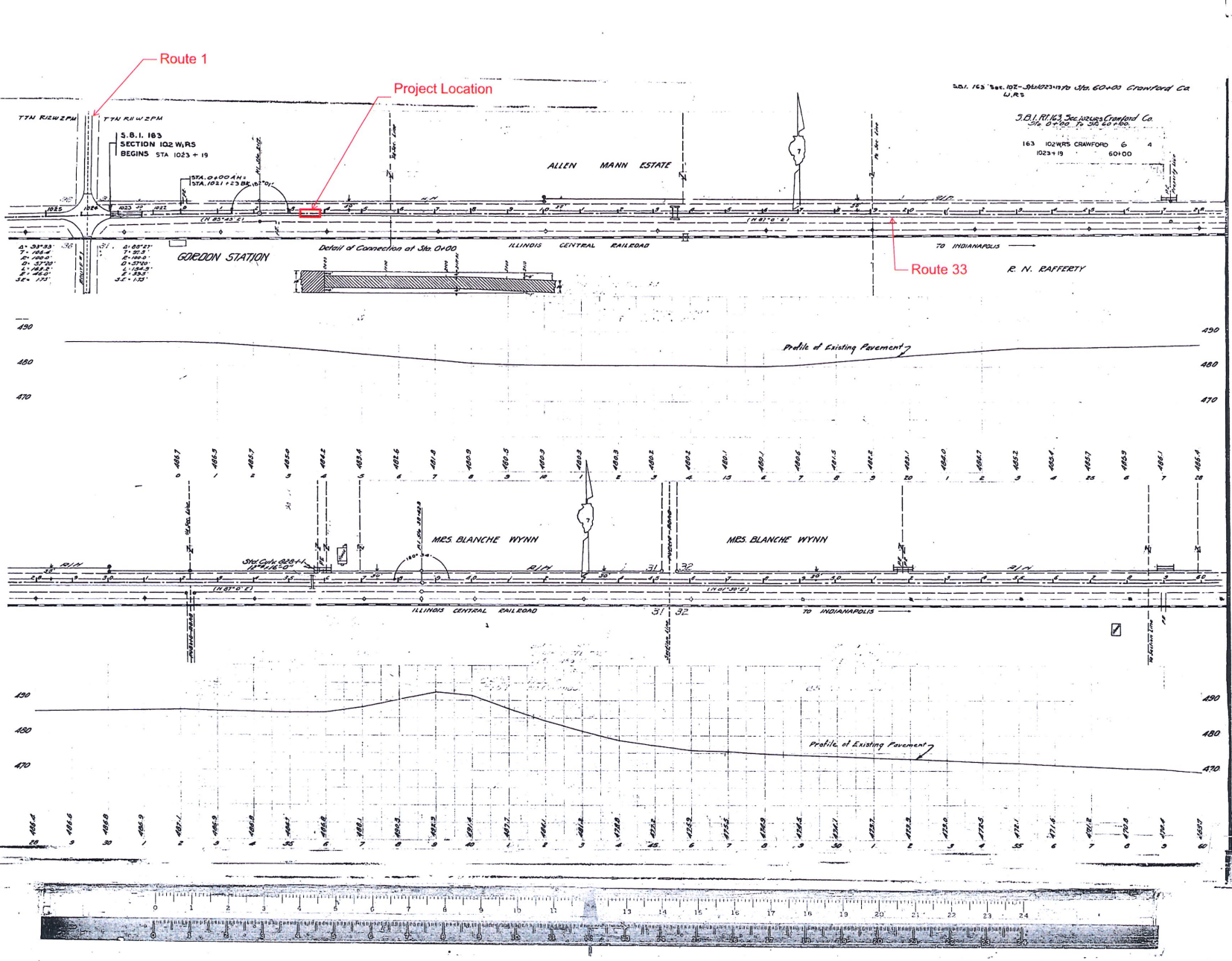
RTE. 33 IDOT CROSSINGS

SHEET NUMBER
C2

PROJECT NO.: 0210007.0(


E Willis Dr
N Trimble Rd
1300E
26
25
30
7N 11W
7N 12W
1
35
1220th
36
31
33
E Main St
N 1300th St
N 1500th St
Gordon
PROJECT LOCATION
Crawford County
Section 31
Township 7 North
Range 11 West
© 2021 Google
Imagery Date: 6/5/2018


101-001
12.67
101-002
21.45
126-001
39.3
151-007
10.59
151-008
1.89
151-009
2.89
176-001
16.7
PROJECT AREA
WATER MAIN
IDOT ALIGNMENT
STA. 207+00 TO 10+50
IL ROUTE 1 RIGHT-OF-WAY
IL 33 E 1050th AVE.
IL ROUTE 33 RIGHT-OF-WAY
INRD RR
501-003
501-001
821.4
240.03
373.86
344.53


Route 1
Project Location
Route 33
S.B.I. 163 Sec. 102-3R&1023+19 To Sta. 60+00 Crawford Co. U.R.S.
T7N R12W 2PM
T7N R11W 2PM
S.B.I. 163
SECTION 102 W,RS
BEGINS STA 1023 + 19
ALLEN MANN ESTATE
GORDON STATION
Detail of Connection at Sta. 0+00
ILLINOIS CENTRAL RAILROAD
TO INDIANAPOLIS
R. N. RAFFERTY
Profile of Existing Pavement
MRS. BLANCHE WYNN
MRS. BLANCHE WYNN
ILLINOIS CENTRAL RAILROAD
TO INDIANAPOLIS
Profile of Existing Pavement

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

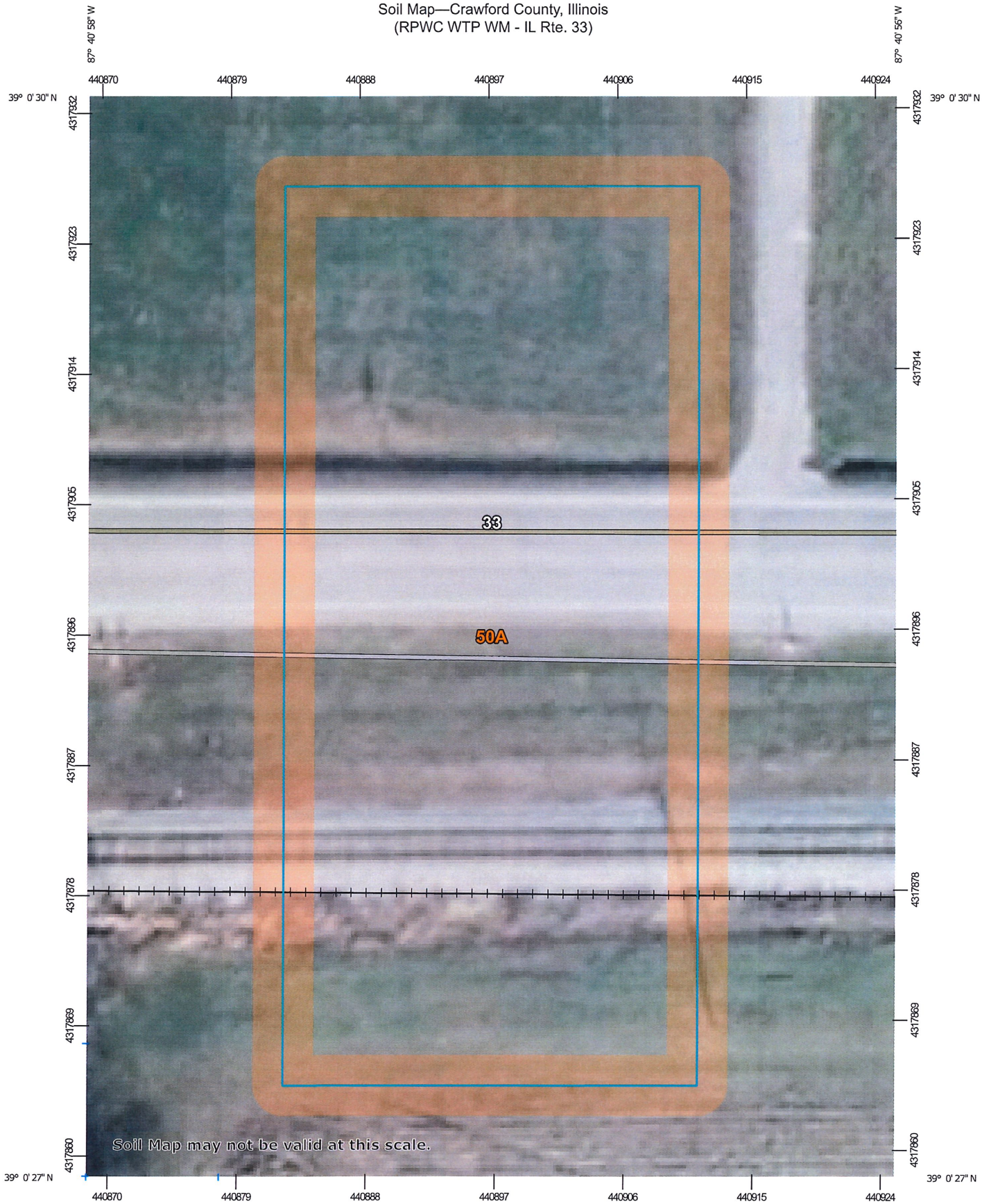
Soil Survey Area: Crawford County, Illinois
Survey Area Data: Version 21, Aug 28, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 24, 2020—Dec 9, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Soil Map—Crawford County, Illinois
(RPWC WTP WM - IL Rte. 33)



Map Scale: 1:364 if printed on A portrait (8.5" x 11") sheet.

N

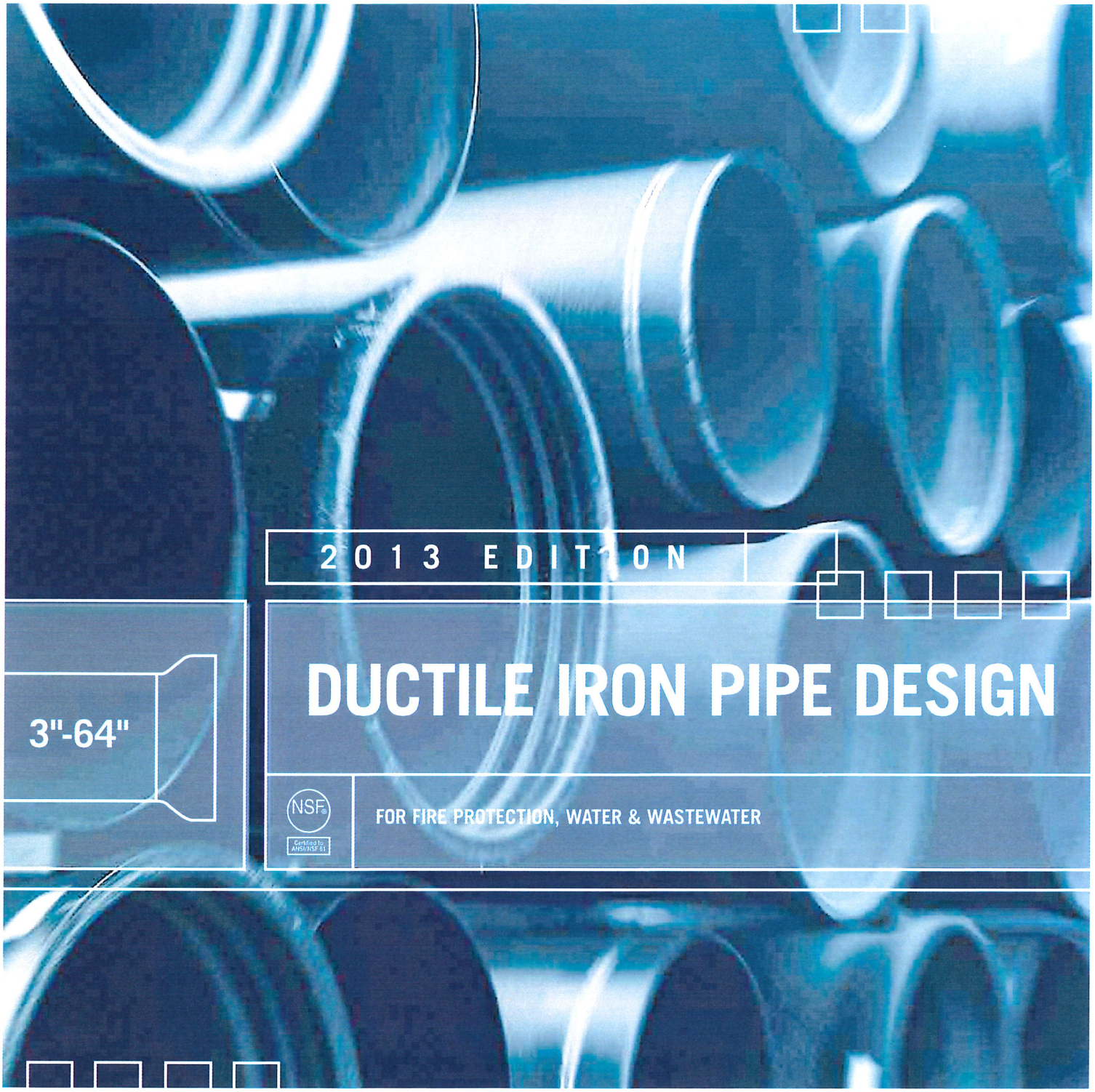
Meters: 0 5 10 20 30

Feet: 0 15 30 60 90

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
50A	Virden silty clay loam, 0 to 2 percent slopes	0.4	100.0%
Totals for Area of Interest		**0.4**	**100.0%**



2013 EDITION

DUCTILE IRON PIPE DESIGN

3"-64"

NSF Certified to ANSI/NSF 61

FOR FIRE PROTECTION, WATER & WASTEWATER

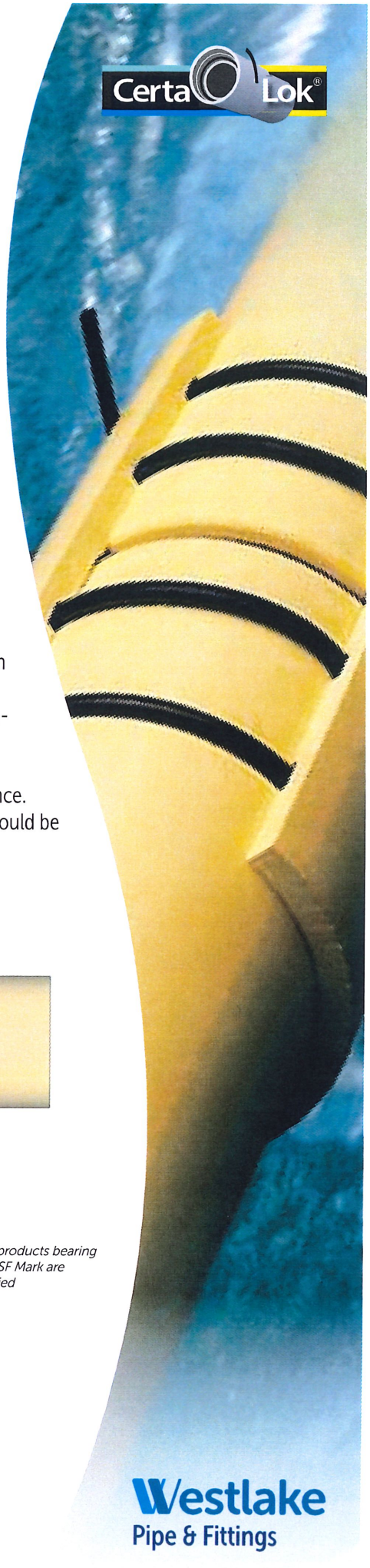
MORE THAN JUST PIPE.

U.S. PIPE

Municipal

PRODUCT SPECIFICATION

D2241/RJ CERTA-LOK® YELOMINE® PVC PRESSURE PIPE | Restrained Joint



Our D2241/RJ Certa-Lok Yelomine PVC Pressure Pipe is manufactured to meet the demands of today's municipal needs for water and wastewater applications. Certa-lok pipe utilizes precision-machined grooves on the pipe and in both sides of the coupling which, when aligned, allow a spline to be inserted, resulting a fully circumferential restrained joint. Flexible elastomeric gaskets in the coupling provide a hydraulic seal.

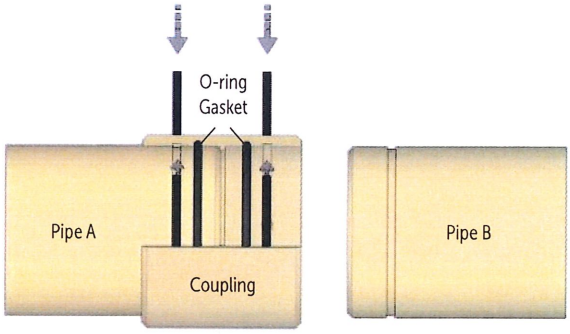
Trenchless & Restrained Joint Open-Cut Applications: This unique restrained joint pipe system is designed for trenchless applications with robust tensile strength for pulling multiple segments underground. This product reduces the jobsite footprint and minimizes community disruption with a reduced need for larger staging areas and traffic control.

Yelomine Formulation Enhancement for Aboveground and Temporary Bypass Applications: Yelomine products are manufactured from a specially formulated PVC compound that contains impact modifiers and UV inhibitors. This special formulation provides up to 6x the impact strength of normal PVC pipe over an extended period of time allowing for Yelomine products to be used aboveground and in high-impact situations like temporary bypass. Joints assembled with the non-permanent gasket option can be disassembled and reused for future jobs or system changes.

16" PR 200 psi couplings are manufactured from fibreglass and do not have enhanced UV resistance. For above ground installation, Yelomine products restrain the joints - the proposed installation should be analyzed for additional restraint requirements.

INSTALLATION METHODS

- Above Ground
- Temporary Bypass
- Static Pipe-bursting
- Horizontal Directional Drilling
- Open-cut



Applications	Potable Water	Wastewater	ReclaimedWater
Pipe Color:	Yellow	Green	Purple
Coupling Color:	Yellow	Yellow	Yellow
Certifications:*	NSF 61, NSF 14*	None	None

** SDR 26, SDR 21, SDR 17 pipe with PVC couplings rated up to 250 psi rated only.*

NSF *Only products bearing the NSF Mark are Certified*

Westlake Pipe & Fittings

www.westlakepipe.com

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PERMIT PROVISIONS

District 7 includes the Counties of: Clark, Clay, Coles, Crawford, Cumberland, Edwards, Effingham, Fayette, Jasper, Lawrence, Macon, Moultrie, Richland, Shelby, Wabash and Wayne. All utility facilities installed on state highway right-of-way within District 7 shall conform to the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" except as amended by these provisions.

The Permittee is hereby granted permission to encroach on the Illinois state highway right-of-way as shown on the attached plans and provisions which are made a part of this permit. A copy of the issued Utility Permit must be on the job site during utility installation activities. It is the Permittee's responsibility to insure all persons working on their behalf have a signed copy of the permit; including but not limited to the application, specifications, plans and the traffic control.

*** For additional useful permit information go to the Utility Permits web page at:**
http://www.idot.illinois.gov/doing-business/permits/utility-permits/index

Contacts:

D7 Utility Permit Unit (Contact Five Days Prior to Start of Work)
(217) 342-8310 - Elly Osborne, Utility Permits Technician

Traffic Control
(217) 342-8285 - Any specific questions about traffic control issues or concerns

IDOT Underground Wiring (Required Contact Five Days Prior to Start of Work)
WARNING: IDOT is not a member of JULIE: As non-JULIE members, utility companies are **required** to call the numbers below 5 working days prior to beginning work to receive locates of Department facilities.

(217) 342-5677 or (217) 342-8291 - Department owned wiring locates - fiber, highway lighting, traffic signals and illuminated sign structures

(217) 342-8276 - Department owned wiring locates at Rest Areas - highway lighting, and illuminated sign structures

If you have any questions, please contact the Utility Permit Office, Ms. Elly Osborne by phone at 217-342-8310 or by e-mail at Dot.D7.Permits@illinois.gov.

Utility Coordination for IDOT Construction projects
(217) 342-8315 Right-of-way question regarding utility relocations for public projects

Vegetation Permit Requests - Tree Removal
(217) 342-8276 Rest areas, tree removal, tree trimming or landscape issues

Environmental Studies (Special or Hazardous Waste)
(217) 342-3249 Environmental issues

IDOT Entrance Permit Section
(217) 342-8289/(217) 342-8283

Electronic Signature and Modification of Utility Permits

Using electronic submittals and/or signature is optional for the Permittee. **Please note that attachments or changes may have been added to this document after Permittee signature. Initiation of the actual work constitutes acceptance of the contents in the final executed permit.**

Legal Obligations, Release and Indemnification

The Permittee shall release and indemnify the State in accordance with the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" Section 530.225. In addition, the Permittee shall release, indemnify and hold harmless the State for any accidental breakage or damage to this facility caused by any construction, maintenance work or operations of the Department. The Permittee shall indemnify, defend and hold the State harmless for conflicts regarding right-of-way lines, including resolution of dedicated right-of-way requirements. The right-of-way dimensions shown on this permit, if any, are taken from Department plans. However, it is the Permittee's responsibility to establish the correct property and right-of-way lines. IDOT is not liable for the research, engineering, staking, and the layout of proposed permit locations. IDOT does not verify the accuracy of the dimensions provided on utility plan sheets included in permit applications. It is the responsibility of the utility company to perform installations in accordance with the ACCOMMODATION OF UTILITIES ON RIGHT-OF-WAY and the District 7 Special Provisions. No exceptions will be provided unless a variance is requested, and written approval is provided prior to utility installation.

Noncompliance and Changes to the Permit

Any changes to this permit shall require prior written approval. At any time, if the utility is installed in a manner not meeting Department policy, utility crews may be required to stop work immediately and remove said utilities. If the permitted facility is not placed as shown in the application, the Permittee shall submit a set of as-built plans and follow remediation steps in accordance with "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" Section 530.300.

Important Dates to Remember - Notice of Work Stoppage

Per the Standard Specifications for Roads and Bridge Construction Article 107.09, utility construction or maintenance operations on State highway right-of-way shall be discontinued during periods of inclement weather (such as snowy conditions, maintenance snow removal operations, heavy rain) or hours of darkness or when soil conditions are such that the utility work would result in extensive damage to the highway right-of-way. These restrictions will be waived when emergency work is required to restore vital utility services after contacting this office.

Work Prohibited During Legal Holidays

For the safety of the traveling public, work will not occur during any holiday period unless specifically approved by the utility permit office. These holidays shall include:

New Year's Easter Memorial Day Independence Day Labor Day Thanksgiving Day Christmas Day

The length of the Holiday period shall vary as follows depending on the day of the week the legal holiday falls on or is observed. No other notice will be given for required work stoppage for the holiday periods.

Day of the Holiday	Length of the Holiday Period
Sunday	3 PM Friday – 12 midnight Sunday
Monday	3 PM Friday – 12 midnight Monday
Tuesday	3 PM Friday – 12 midnight Tuesday
Wednesday	3 PM Tuesday – 12 midnight Wednesday
Thursday	3 PM Wednesday – 12 midnight Sunday
Friday	3 PM Thursday – 12 midnight Sunday
Saturday	3 PM Friday – 12 midnight Sunday

Traffic Control

For the health and safety of utility crews working on the right-of-way and the traveling public in work zones, all necessary traffic control shall be used. (Signs, barricades, flaggers, etc.).

Complete lists of Highway Traffic Control Standards are available on the Illinois Department of Transportation's website. For assistance with traffic control, call the Utility Permits office during office hours at (217) 342-8310.

When doing the work covered in this permit, the Permittee is responsible for providing and installing warning signs, protective devices and flaggers. The traffic control standards included in the permit are a minimum requirement and additional or supplemental devices may be required. Traffic Control may be amended by the Department. Message Boards may be required with the Traffic Control Standards listed to ensure public safety when traffic complexities and hazards arise.

The roadway shall remain open to traffic at all times while completing the work unless otherwise authorized by this permit.

Additional Type I barricades, Type II barricades, or vertical panels on 50-foot centers will be required along the edge of the open lane of traffic if the difference in elevation between the open lane and the area adjacent to it exceeds 2 inches.

No construction equipment shall be permitted to park on or use the travel lanes, ramps, shoulders, medians, or crossovers of an access-controlled highway for installing or servicing any facility.

Whenever any of the work under this permit involves any obstruction or hazard to the free flow of traffic in the normal traffic lanes, plans for the proposed method of traffic control must be submitted to and approved by the Region Engineer at least three (3) business days prior to the start of work.

Utility Locations

All utility installations shall conform to "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" Section 530.230 and appropriate sections for the specific utility including the following addition or revisions:

- GPS points will be accepted as an approximation of location. However, they do not give variance to the permit provisions. Right-of-way, dimensions, and GPS are not reviewed for accuracy.
- Longitudinal lines shall be located as near the right-of-way line as practicable. The preferable distance will be the distance requested by the applicant but no more than eight feet (8') from and parallel to the right-of-way line.

- Areas within municipal boundaries are to be within eight feet (8') of the right-of-way but no closer to the pavement than five feet (5').
- All utilities that cross under the State right-of-way shall be placed at a 90-degree angle to the centerline of the pavement.
- Utilities installed near bridge structures shall be a minimum of seventy-five feet (75') beyond the bridge abutment location.
- No utilities are allowed in the shoulder, foreslope, bottom of the ditch, under culverts, or within ten feet (10') of culvert end sections.
- All appurtenances (hand holes, valves, markers, pedestals, poles etc.) must be within one (1') of the right-of-way line and be clearly labeled. All ground mounted appurtenances shall be provided with a well-maintained vegetation-free area extending one (1') beyond the appurtenance in all directions.
- Any utility located within the drip line of any tree designated by the Department to be spared shall be bored under the root system.
- No pole will be allowed in the clear zone of any State highway.

The Permittee shall stay a minimum of two feet (2') away from all sign poles (wooden or steel) and shall not place the facility between or under sign structures. The sign structures shall not to be removed and replaced without the approval of this office.

A minimum bury depth of thirty-six (36") is required for all underground utilities unless crossing a waterway where the minimum bury depth will be fifty-four inches (54") below the flow line elevation of the waterway.

It is the responsibility of the utility company to perform installations in accordance with the ACCOMMODATION OF UTILITIES ON RIGHT-OF-WAY and the District 7 Special Provisions. No exceptions will be provided unless a variance is requested, and written approval is provided prior to utility installation.

Construction Methods for Utility Installation

Construction methods shall conform to Sections 530.500 and 530.510 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" and applicable sections for each specific utility type with the following additions or revisions:

- Construction repair materials shall be placed according to Section 530.500 (f) of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System". If construction materials occupy the right-of-way without additional approval for longer than six months, the Department may remove the materials at the expense of the Permittee.
- The Permittee shall keep the highway pavement clear of mud, gravel, sand, or any other construction debris at all times.
- All saw cuts will be full depth.
- Where practical, excavation material shall be deposited between the roadway and the excavated area as added protection until removal from the right-of-way.
- For no reason shall holes be left open overnight.
- Use of steel plates on the roadway pavements are not permitted.
- A combination of aboveground and belowground markers is used to identify and locate underground facilities. The facility is color-coded in accordance with the American Public Works Association (APWA) guidelines to assist in identifying an aboveground or belowground facility. The purpose of aboveground markers is to identify underground facilities, not to locate for excavation or circumvent the one call process. The owner shall maintain the markers in good condition, must be permanent and weatherproof/UV resistant.

  All existing buried utilities, including pipelines delivering natural gas or other gaseous products, water, salt, sewage, steam, buried electric lines, telephone, fiber optic, broadband, other communication systems, petroleum products, and any other buried facilities with above ground appurtenances thereto located within the rights-of-way of highways under the jurisdiction of the Department shall have such above ground appurtenances clearly marked with the appropriate warning.

  In the case of two or more utilities jointly owning or using a pole or pole line structure, each of the utilities shall mark each pole or structure with the initials of its name, abbreviation of its name, corporate symbol, or other distinguishing mark so that the ownership of such structure may be readily and determined. A utility shall mark each wood pole, post, tower, or other structure used for the support or attachment of electrical conductors, guys, or lamps, with dating nails or similar devices indicating the year in which the structure was installed. The requirements of this rule shall apply to all existing and future erected structures and to all changes in ownership.

Utility Installation within Fully Access-Controlled Right-of-Way

Construction methods for access-controlled highways shall conform to the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" under the specific utility that will be installed, except that the latest laws and standards shall be used. This is including but not limited to facilities along and crossing said highways, both above-ground and underground.

Access control fence may be opened to install specifically approved utilities but at no time is the fence to be left unrestricted. The restricted entry must be maintained at all times by placing a temporary barrier, taping or roping off the opened areas until the restoration of access control fence can be made. The repair to the fence will be made in kind and consist of replacement from post to post of the opened area to enable construction of the utility.

Longitudinal construction must stay as close as possible and no further than eight feet (8') from the right-of-way line.

Handholes along the interstate shall be buried a minimum of 12 inches and the markers placed at the right of way.

A depth of forty-eight inches (48") or greater for all underground utilities shall be maintained within access-controlled right-of-way unless crossing a waterway where the minimum allowed depth shall be sixty inches (60") below the flow line elevation of the waterway.

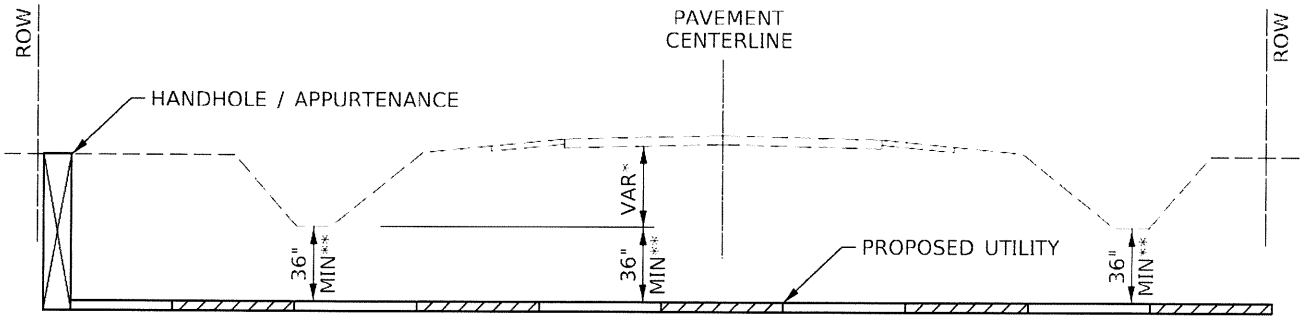
No utility or appurtenances (e.g., pumping stations, transformers, handholes, pedestals, markers) will be allowed within interchange areas of the right-of-way.

Utilities installed near bridge structures shall be a minimum of seventy-five feet (75') beyond the bridge abutment location.

Typical Cross Sections

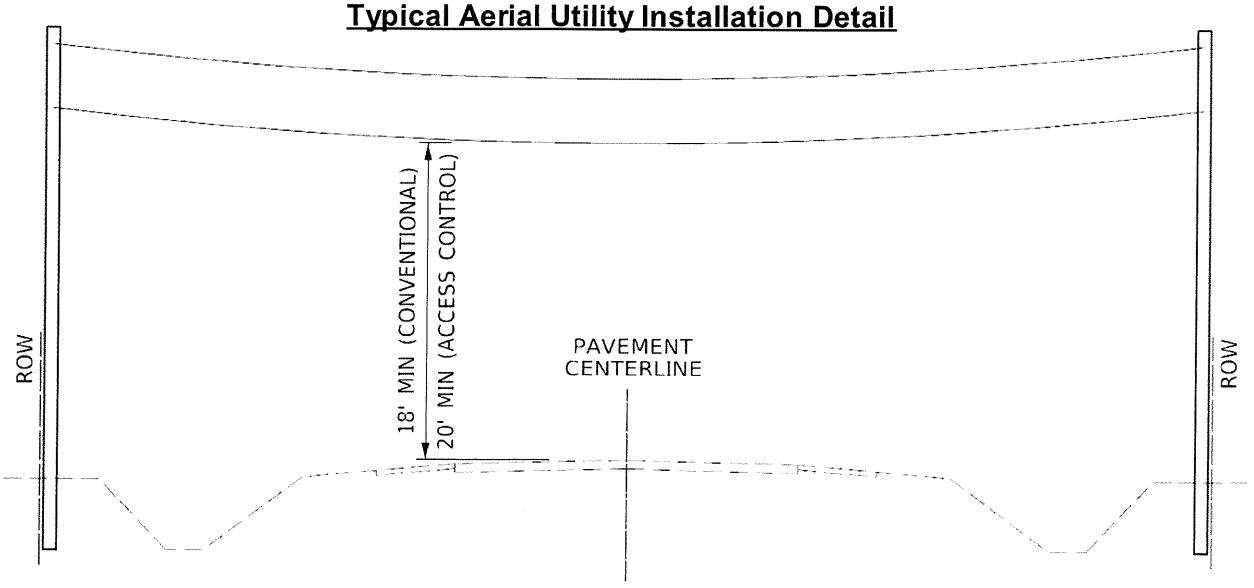
Utility installations shall conform to the cross sections provided below. Deviation from these typical sections shall require review and prior written approval from the Department.

Typical Underground Utility Installation Detail



*A 36" MINIMUM BURY DEPTH IS REQUIRED IN LOCATIONS WHERE NO ROADSIDE DITCHES ARE PRESENT
**A 48" MINIMUM BURY DEPTH IS REQUIRED WHEN CROSSING ACCESS-CONTROLLED RIGHT-OF-WAY

Typical Aerial Utility Installation Detail



Miscellaneous Utility Items

All facilities (including anchors, guys, fixtures, and appurtenances) shall be located and constructed in accordance with the description, details and provisions included in the approved utility permit as well as the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System". The Permittee shall thereafter operate and maintain said facilities, all to the satisfaction of the Regional Engineer or his duly authorized representative, and all work and material shall conform the "Standard Specifications for Road and Bridge Construction in Illinois".

Petroleum Products Pipelines

Petroleum products pipelines shall be constructed, maintained, and operated in accordance with Section 530.420 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System".

Power and Communication Lines

Above ground power and communication facilities shall conform to Section 530.450 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" and appropriate sections for the specific utility type except that:

- Underground facilities shall conform to Section 530.400 and appropriate sections for specific utility type.
- Underground power cables must be grounded in accordance with the National Electrical Safety Code.

Power

All power lines installed on state highway right-of-way shall conform to Section 530.450 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" for underground and Section 530.450 for above ground facilities.

Cable

All cable lines shall be constructed, maintained, and operated in accordance with Section 530.400 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System".

Gas

Gas pipelines installed on State highway right-of-way shall conform to Section 530.410 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" except that the latest laws and standards shall be used.

Water Lines

Water lines installed on State highway right-of-way shall conform to Section 530.430 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" except that the latest laws and standards shall be used.

Any water lines six inches and larger must be encased under the highway. After the pipe laying is completed, the Permittee shall completely backfill the trench in three equal lifts, each lift being mechanically tamped.

Sewer Lines and Drainage Lines

Sewer and Drainage lines installed on State highway right-of-way shall conform to Section 530.440 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" except that the latest laws and standards shall be used.

Highway Lighting

Highway lighting installed on State highway right-of-way shall conform to Section 530.460 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" except that:

- All current laws and standards shall be used.
- The Permittee is responsible for 100% of all energy costs, work and maintenance of any or all facilities related to these installations unless stipulated in other written agreements.
- Highway lighting shall be pre-approved by the Department's Central Office prior to start of work.

Trenchless Utility Installation

Trenchless utility installation shall conform to Sections 530.500 and 530.510 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" and applicable sections for each specific utility type except that:

- "Boring and Jacking" shall be replaced with "Boring and Jacking or Horizontal Directional Drilling". Horizontal Directional drilling may be substituted for Jack and Bore with specific approval from the Department.
- For the purpose of these provisions, the term "Bore" applies to all approved trenchless technologies.
- Pneumatic drilling and hammer drilling are not allowed.
- There shall be no tunneling whatsoever under and across the shoulders and pavement.
- Encasement shall be furnished between bore pits unless continuous pipe or Department approved jointed pipe is used under the roadway structure (refer to Section 530.30 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System", "Department Approved").
- No pits will be allowed in the shoulder, foreslope or the bottom of the ditch.

Pavement Restoration

Patching Details

If a patch is necessary, all exterior and interior edges shall be made with saw cuts.

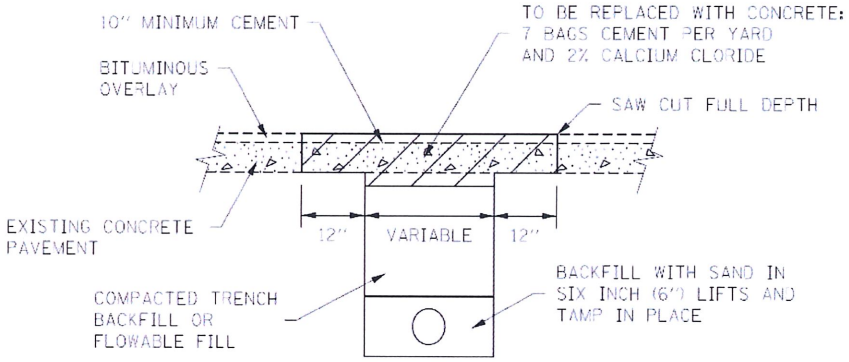
The pavement shall be scored no more than one day prior to the start of work except when pavement is closed to traffic. Materials resulting from the removal of the existing pavement shall be disposed of according to Article 202.03 of the "Standard Specifications for Roads and Bridge Construction in Illinois".

Finished Open Cut Patch Detail and Hot Mix Asphalt Patch Detail

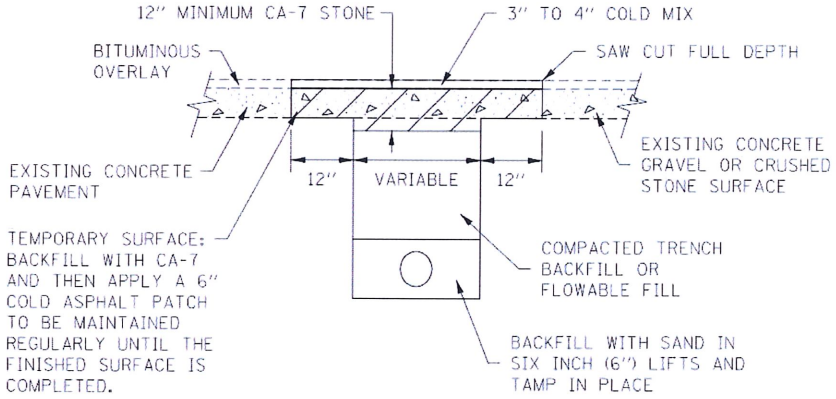
The subbase shall be moistened just prior to concrete placement. If rain is imminent, concrete shall not be poured, and unhardened concrete shall be covered immediately. The surface shall be textured according to Article 420.09 of the current "Standard Specifications for Road and Bridge Construction in Illinois".

When concrete is placed after October 15th and before April 15th, a protective coat shall be applied to the surface according to Article 420.18 of the current "Standard Specifications for Road and Bridge Construction in Illinois". Concrete may be placed when the air temperature is above 40 degrees and rising and falling temperature reaches 45 degrees. High-Early Strength concrete shall be used after 11:30 AM when repairing patches; the patch shall be opened prior to the contractor leaving the work to avoid an overnight lane closure.

Finished Open Cut Patch Detail (Concrete)

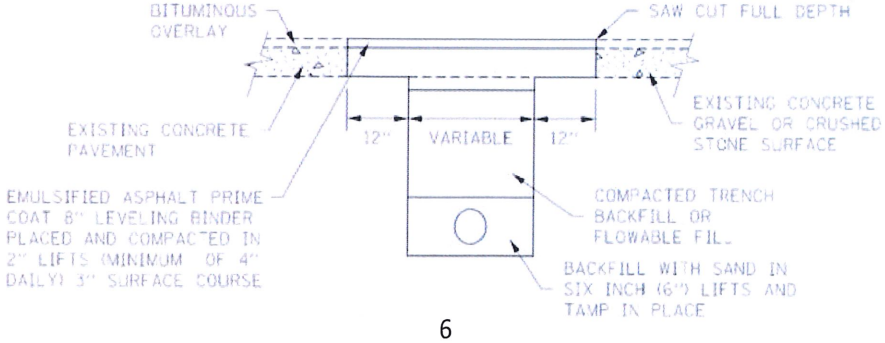


Temporary Hot-Mix Asphalt Patch Detail



Finished Open Cut Patch Detail (Hot-Mix Asphalt)

HMA shall be placed on a clean, dry base and when weather conditions are suitable. The leveling binder and binder courses shall be placed only when the temperature in the shade is at least 40° F (5° C) and the forecast is for rising temperatures. The surface course shall be placed only when the air temperature in the shade is at least 45° F (8° C) and the forecast is for rising temperatures.



Right-of-Way Restoration

The right-of-way shall be restored in accordance with Section 530.250 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" except that restoration shall also include the following provisions:

- Any drainage mat or pipe under drains damaged during utility installation operations shall be repaired or replaced.
- Pavement cuts allowed by Section 530.500(e) of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" shall be removed and replaced with a permanent patch within six months.
- The right-of-way shall be returned, in a timely manner, to a condition which is at least as good as it was before the permitted work took place. This includes restoration of entrances and side roads. Restoration of roadway surfaces will be made using Department approved materials and methods (refer to Section 530.30 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System", "Department Approved").
- If sidewalks are damaged by the permittee or permittee's contractors, the repair shall conform to the current ADA standards to the maximum extent practicable. Proposed construction of sidewalks or repairs shall conform to the current Section 424 of the "Standard Specifications for Road and Bridge Construction in Illinois".
- The Permittee will shape, fertilize, seed and straw all right-of-way damaged in the construction of utilities. The following quantities shall be used:

  Fertilizer: 10-6-4 800 lbs. per acre.
  Seed: 50 lbs. Blue Grass, 16 lbs. Perennial Rye, 8 lbs. Red Top and 2 lbs. White Dutch Clover per acre.
  Straw: 2 tons per acre.

Handholes

Handholes, vaults and junction boxes must be installed flush with the surrounding ground elevation and constructed of polymer concrete or quazite. All structures must be heavy-duty with a minimum load rating of tier 15, tier 22 or 20,000 lbs. All handhole covers need to be appropriately labeled on the installed handholes and marked on the plans.

Vegetation Control

Tree trimming/removal and vegetation control shall be in accordance with Sections 530.600 and 500.610 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" with the following additions:

- Tree trimming/removal must be identified and noted on the permit plan sheet and kept to a minimum. A review by Department personnel shall be done prior to any cutting or spraying operation. The Department reserves the right to deny specific trimming/removal/spraying requests.
- Fines may be accessed by other agencies for improper vegetation control.
- At no time shall vehicles, construction equipment, or construction material be permitted in protected areas such as restoration area seedlings, roadside prairie, or other areas designated by signage. The method of utility installation in the protected areas will be completed solely by directional boring.

NPDES

The NPDES Permit program imposes erosion and sediment control requirements on construction projects that involve disturbance of 0.4 hectares (1acre) or more of total land area. All NPDES requirements must be followed on Utility Permits. If this project has no clearing or grubbing, excavation, stockpiling of topsoil, borrow, or construction of embankment, these type of projects will normally be exempt from erosion and sediment control measures.

Drainage

It is understood and agreed that the Permittee, their successors, or assigns shall not alter or change the existing natural drainage contours to discharge additional storm water onto the State highway right-of-way. If a change is proposed in the grade, area, or type of surface, the Permittee, his successors, or assigns shall submit a plan to the Illinois Department of Transportation for review and written approval before making such changes.

Utility Emergency and Maintenance Repairs

A permit is required when maintenance or an emergency is to be performed on utility facilities. The utility owner shall notify the Department immediately when emergency repairs are needed. Emergency repairs are those that correct a condition which is life-threatening or causing immediate peril. These emergency repairs may be conducted immediately but must be followed up by written notification in the form of a completed utility permit application as per District 7. Permittee shall comply with all emergency repair procedures in Section 530.290(c)(1)(2)(3)(4). Maintenance work is that which is performed to restore the integrity of the utility to the original condition and a permit should be requested following the standard utility permitting procedure before beginning this work. Work which changes the facility by upgrading, downgrading, or removing the facility will not to be considered maintenance.

The Permittee shall assume all responsibility for interference with existing utilities in, along, or upon said highway.

January 1, 2025

Illinois Department of Transportation

Standards by Division

DIVISION 700 WORK ZONE TRAFFIC CONTROL AND PROTECTION, SIGNING, AND PAVEMENT MARKING

STD. NO.	TITLE
WORK ZONE TRAFFIC CONTROL AND PROTECTION	
701001-02	Off-Road Operations, 2L, 2W, More Than 15' (4.5 m) Away
701006-05	Off-Road Operations, 2L, 2W, 15' (4.5 m) to 24" (600 mm) From Pavement Edge
701011-04	Off-Road Moving Operations, 2L, 2W, Day Only
701101-05	Off-Road Operations, Multilane, 15' (4.5 m) to 24" (600 mm) From Pavement Edge
701106-02	Off-Road Operations, Multilane, More Than 15' (4.5 m) Away
701201-05	Lane Closure, 2L, 2W, Day Only, for Speeds ≥ 45 MPH
701206-05	Lane Closure, 2L, 2W, Night Only, for Speeds ≥ 45 MPH
701301-04	Lane Closure, 2L, 2W, Short Time Operations
701306-04	Lane Closure, 2L, 2W, Slow Moving Operations Day Only, for Speeds ≥ 45 MPH
701311-03	Lane Closure, 2L, 2W, Moving Operations - Day Only
701316-14	Lane Closure, 2L, 2W, Bridge Repair
701321-19	Lane Closure, 2L, 2W, Bridge Repair with Barrier
701326-04	Lane Closure, 2L, 2W, Pavement Widening, for Speeds ≥ 45 MPH
701331-05	Lane Closure, 2L, 2W, With Run-Around, for Speeds ≥ 45 MPH
701336-07	Lane Closure, 2L, 2W, Work Areas in Series, for Speeds ≥ 45 MPH
701400-12	Approach to Lane Closure, Freeway/Expressway
701401-13	Lane Closure, Freeway/Expressway
701402-12	Lane Closure, Freeway/Expressway, with Barrier
701406-13	Lane Closure, Freeway/Expressway, Day Operations Only
701411-09	Lane Closure, Multilane, at Entrance or Exit Ramp, for Speeds ≥ 45 MPH
701416-11	Lane Closure, Freeway/Expressway, with Crossover and Barrier
701421-08	Lane Closure, Multilane, Day Operations Only, for Speeds ≥ 45 MPH to 55 MPH
701422-10	Lane Closure, Multilane, for Speeds ≥ 45 MPH to 55 MPH
701423-10	Lane Closure, Multilane, with Barrier, for Speeds ≥ 45 MPH to 55 MPH
701426-09	Lane Closure, Multilane, Intermittent or Moving Operation, for Speeds ≥ 45 MPH
701427-05	Lane Closure, Multilane, Intermittent or Moving Operation, for Speeds ≤ 40 MPH
701428-01	Traffic Control, Setup and Removal, Freeway/Expressway
701431-13	Lane Closure, Multilane, Undivided with Crossover, for Speeds ≥ 45 MPH to 55 MPH
701446-11	Two Lane Closure, Freeway/Expressway
701451-05	Ramp Closure Freeway/Expressway
701456-05	Partial Exit Ramp Closure Freeway/Expressway
701501-06	Urban Lane Closure, 2L, 2W, Undivided
701502-09	Urban Lane Closure, 2L, 2W, with Bidirectional Left Turn Lane
701601-09	Urban Lane Closure, Multilane, 1W or 2W with Nontraversable Median
701602-10	Urban Lane Closure, Multilane, 2W with Bidirectional Left Turn Lane
701606-10	Urban Single Lane Closure, Multilane, 2W with Mountable Median
701611-01	Urban Half Road Closure, Multilane, 2W with Mountable Median
701701-10	Urban Lane Closure, Multilane Intersection

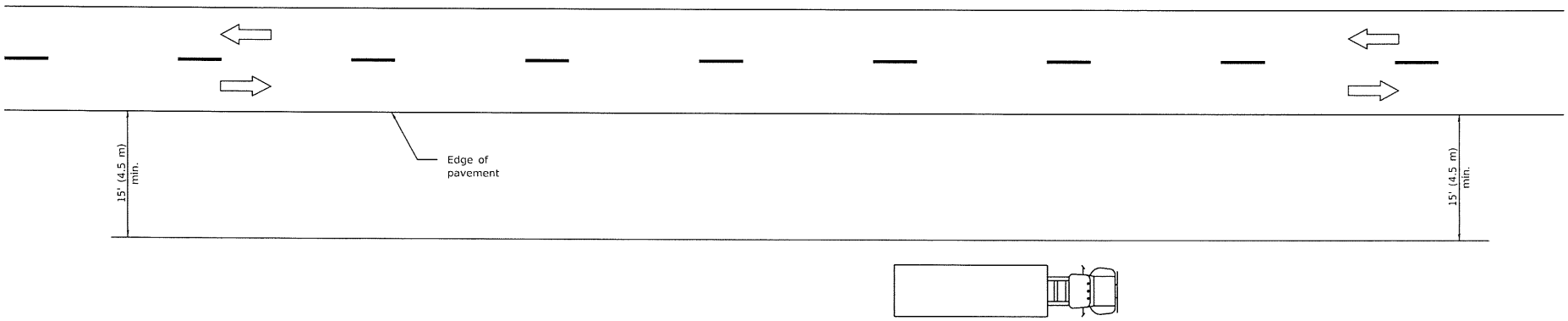
701801-06 Sidewalk, Corner or Crosswalk Closure
701901-10 Traffic Control Devices
704001-08 Temporary Concrete Barrier

SIGNING

720001-01 Sign Panel Mounting Details
720006-04 Sign Panel Erection Details
720011-01 Metal Posts for Signs, Markers and Delineators
720016-04 Mast Arm Mounted Street Name Signs
720021-03 Sign Panels, Extruded Aluminum Type
725001-01 Object and Terminal Markers
728001-01 Telescoping Steel Sign Support
729001-01 Applications of Types A and B Metal Posts (For Signs & Markers)
731001-01 Base for Telescoping Steel Sign Support

PAVEMENT MARKING

780001-05 Typical Pavement Markings
781001-04 Typical Applications Raised Reflective Pavement Markers
782001-01 Curb Reflectors
782006-01 Guardrail and Barrier Wall Reflector Mounting Details



TYPICAL APPLICATIONS

Landscaping work

Utility work

Fencing contracts and maintenance

Cleaning culverts

GENERAL NOTES

This Standard is used where at all times all vehicles, equipment, workers or their activities are more than 15' (4.5 m) from the edge of pavement.

When the work operation requires that two or more work vehicles cross the 15' (4.5 m) clear zone in any one hour, traffic control shall be according to Standard 701006.

All dimensions are in inches (millimeters) unless otherwise shown.

Illinois Department of Transportation

PASSED January 1. 2009
ENGINEER OF OPERATIONS

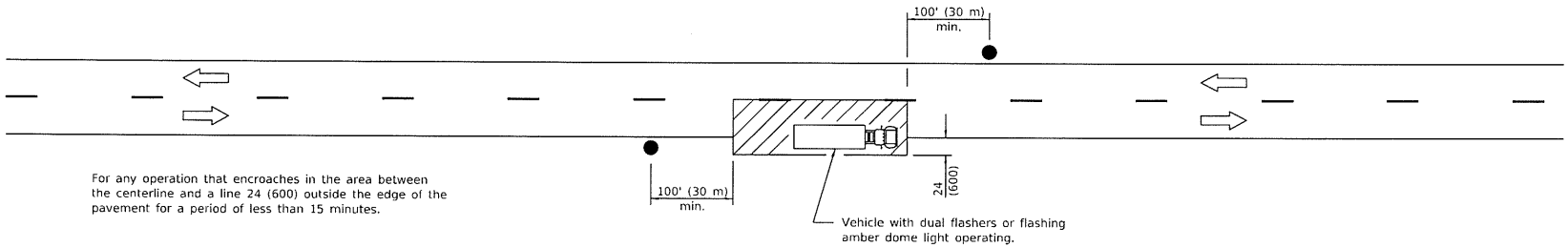
APPROVED January 1. 2009
ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-97

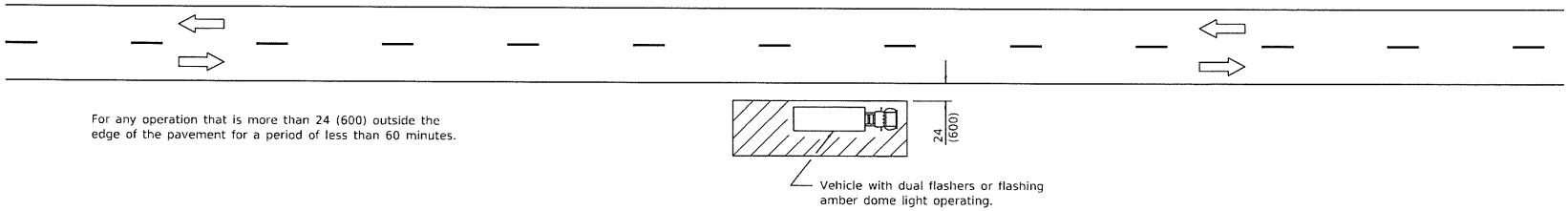
DATE	REVISIONS
1-1-09	Switched units to
	English (metric).
1-1-05	Revised title and notes.

OFF-RD OPERATIONS, 2L, 2W, MORE THAN 15' (4.5 m) AWAY

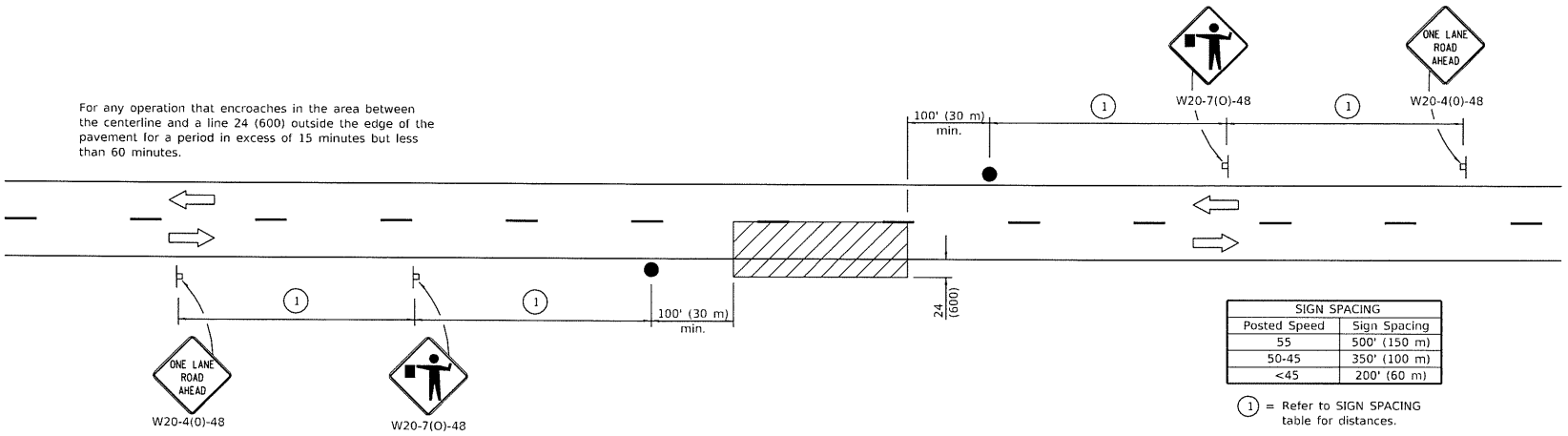
STANDARD 701001-02



For any operation that encroaches in the area between the centerline and a line 24 (600) outside the edge of the pavement for a period of less than 15 minutes.



For any operation that is more than 24 (600) outside the edge of the pavement for a period of less than 60 minutes.



For any operation that encroaches in the area between the centerline and a line 24 (600) outside the edge of the pavement for a period in excess of 15 minutes but less than 60 minutes.

SIGN SPACING	
Posted Speed	Sign Spacing
55	500' (150 m)
50-45	350' (100 m)
<45	200' (60 m)

(1) = Refer to SIGN SPACING table for distances.

TYPICAL APPLICATIONS

Marking patches
Field survey
String line
Utility operations
Cleaning up debris on pavement

SYMBOLS

Work area

Sign on portable or permanent support

Flagger with traffic control sign

All dimensions are in inches (millimeters) unless otherwise shown.

Illinois Department of Transportation

PASSED January 1, 2011
ENGINEER OF SAFETY ENGINEERING

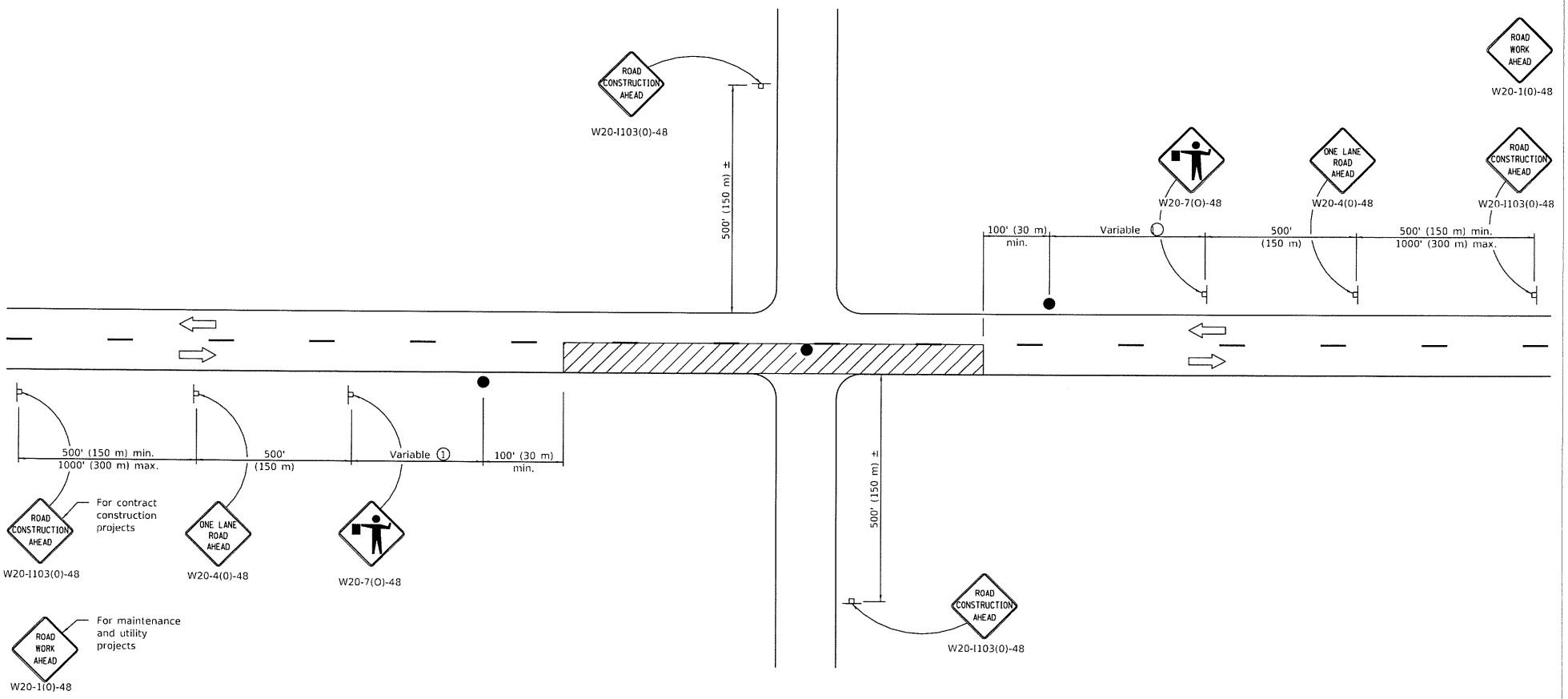
APPROVED January 1, 2011
ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-97

DATE	REVISIONS
1-1-11	Revised flagger sign.
1-1-09	Switched units to
	English (metric).

LANE CLOSURE, 2L, 2W, SHORT TIME OPERATIONS

STANDARD 701301-04



TYPICAL APPLICATIONS

Bituminous resurfacing
Milling operations
Utility operations
Shoulder operations

SYMBOLS

Work area

Sign on portable or permanent support

Flagger with traffic control sign

① Minimum distance is 200' (60 m). Maximum distance to be determined by the Engineer but should not exceed ½ the length required for one normal working day's operation or 2 miles (3200 m), whichever is less.

GENERAL NOTES

This Standard is used where at any time, any vehicle, equipment, workers or their activities require an intermittent or continuous moving operation on the pavement where the average speed of movement is greater than ½ mph (1 km/h) and less than 4 mph (6 km/h).

When the operation does not exceed 60 minutes, traffic control may be according to Standard 701301.

All dimensions are in inches (millimeters) unless otherwise shown.

Illinois Department of Transportation

PASSED January 1, 2018
ENGINEER OF SAFETY PROG. AND ENGINEERING

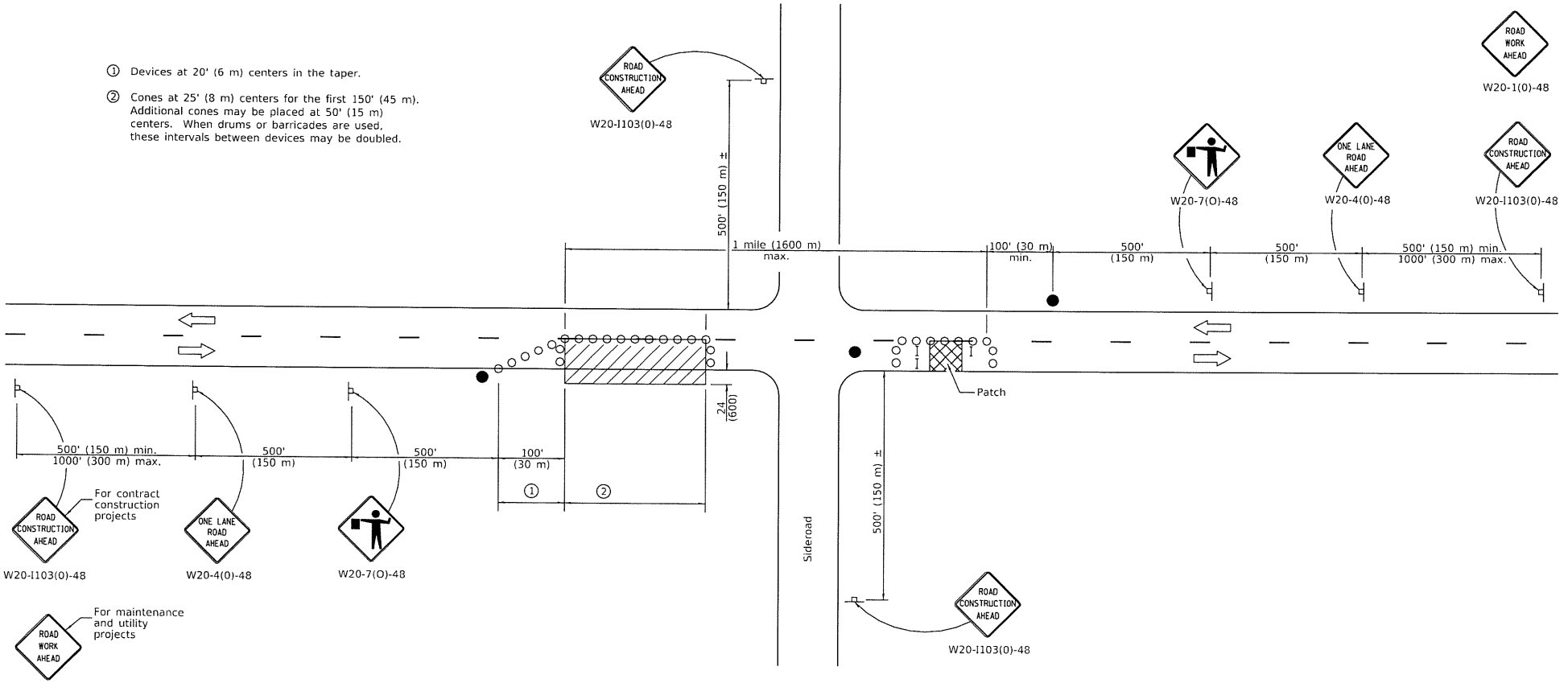
APPROVED January 1, 2018
ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-97

DATE	REVISIONS
1-1-18	Revised lower speed limit
	for operation to ½ mph.
1-1-11	Revised flagger sign.

LANE CLOSURE, 2L, 2W, SLOW MOVING OPERATIONS DAY ONLY, FOR SPEEDS ≥ 45 MPH

STANDARD 701306-04



TYPICAL APPLICATIONS

Isolated patching
Utility operations
Storm sewer
Culverts
Cable placement

SYMBOLS

- Work area
- Sign
- Barricade or drum
- Cone, drum or barricade
- Flagger with traffic control sign

GENERAL NOTES

This Standard is used where at any time, any vehicles, equipment, workers or their activities will encroach in the area between the center line and a line 24 (600) outside the edge of pavement for daylight operation.

When the distance between successive work areas exceeds 2000' (600 m), additional warning signs, flaggers, and taper shall be placed as shown.

All dimensions are in inches (millimeters) unless otherwise shown.

Illinois Department of Transportation

APPROVED January 1, 2019
ENGINEER OF SAFETY PROG. AND ENGINEERING

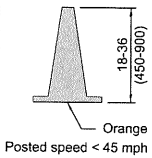
APPROVED January 1, 2019
ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-97

DATE	REVISIONS
1-1-19	Revised device spacing in taper.
1-1-11	Revised flagger sign.

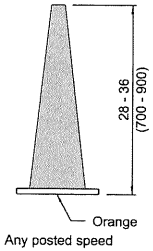
LANE CLOSURE, 2L, 2W, DAY ONLY, FOR SPEEDS ≥ 45 MPH

STANDARD 701201-05

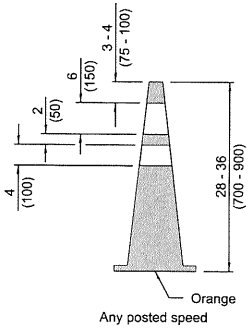


Posted speed < 45 mph

DAYTIME USE

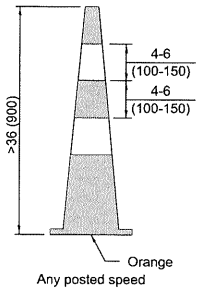


Any posted speed



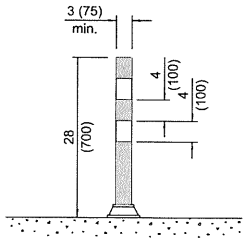
Any posted speed

CONES

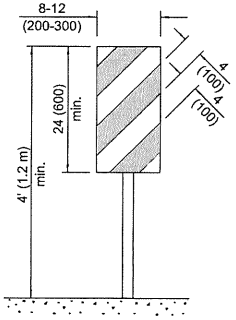


Any posted speed

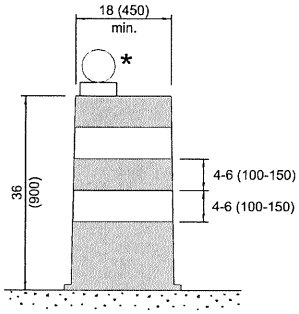
DAY OR NIGHTTIME USE



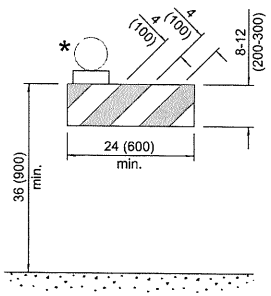
TUBULAR MARKER



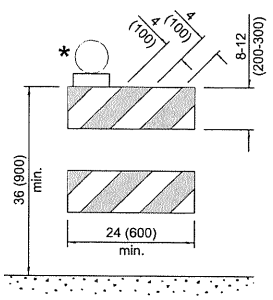
VERTICAL PANEL
POST MOUNTED



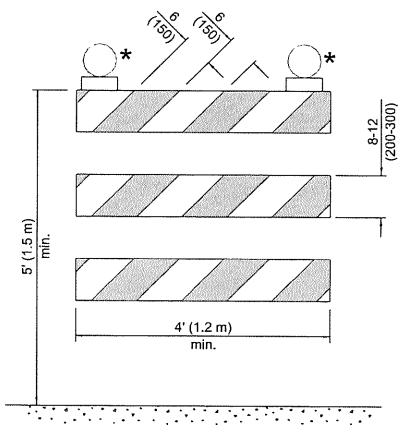
DRUM



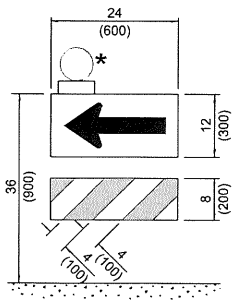
TYPE I BARRICADE



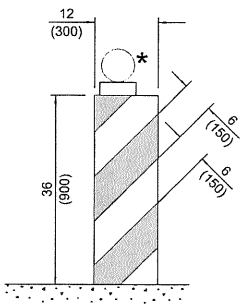
TYPE II BARRICADE



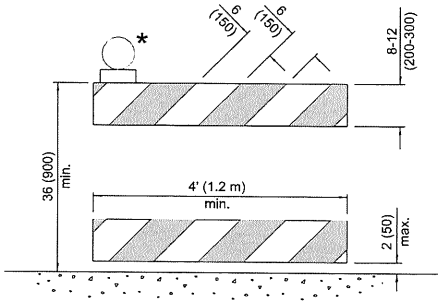
TYPE III BARRICADE



DIRECTION INDICATOR BARRICADE



VERTICAL BARRICADE



DETECTABLE PEDESTRIAN CHANNELIZING BARRICADE

* Warning lights (if required)

GENERAL NOTES

All heights shown shall be measured above the pavement surface.

All dimensions are in inches (millimeters) unless otherwise shown.

Illinois Department of Transportation

APPROVED January 1, 2025
ENGINEER OF SAFETY PROG. AND ENGINEERING

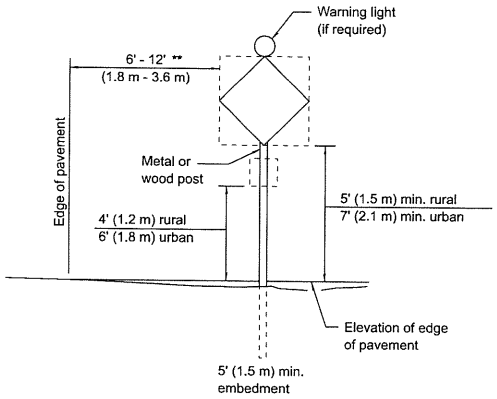
APPROVED January 1, 2025
ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-13

DATE	REVISIONS
1-1-25	Updated Temporary Rumble
	Strip Detail (sht. 3).
1-1-24	Revised Type III Barricade notes
	(sht. 3) & moved warning light on
	post mounted signs to top center.

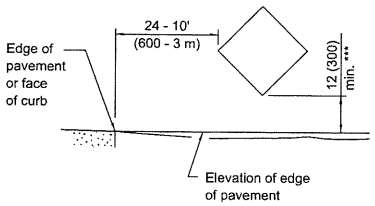
TRAFFIC CONTROL DEVICES

STANDARD 701901-10



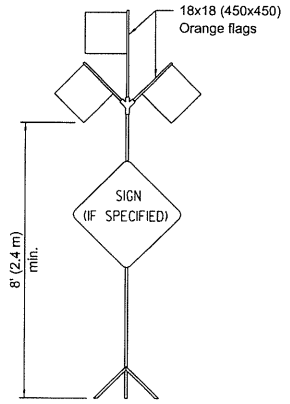
POST MOUNTED SIGNS

** When curb or paved shoulder are present this dimension shall be 24 (600) to the face of curb or 6' (1.8 m) to the outside edge of the paved shoulder.

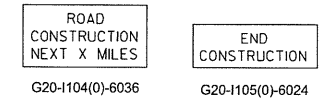


SIGNS ON TEMPORARY SUPPORTS

*** When work operations exceed four days, this dimension shall be 5' (1.5 m) min. If located behind other devices, the height shall be sufficient to be seen completely above the devices.



HIGH LEVEL WARNING DEVICE



G20-I104(0)-6036 G20-I105(0)-6024

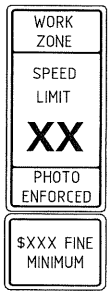
This signing is required for all projects 2 miles (3200 m) or more in length.

ROAD CONSTRUCTION NEXT X MILES sign shall be placed 500' (150 m) in advance of project limits.

END CONSTRUCTION sign shall be erected at the end of the job unless another job is within 2 miles (3200 m).

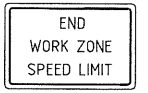
Dual sign displays shall be utilized on multi-lane highways.

WORK LIMIT SIGNING



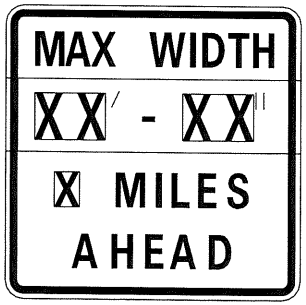
W21-III5(0)-3618
R2-1-3648
R10-I108p-3618 ****
R2-I106p-3618

Sign assembly as shown on Standards or as allowed by District Operations.



G20-I103-6036

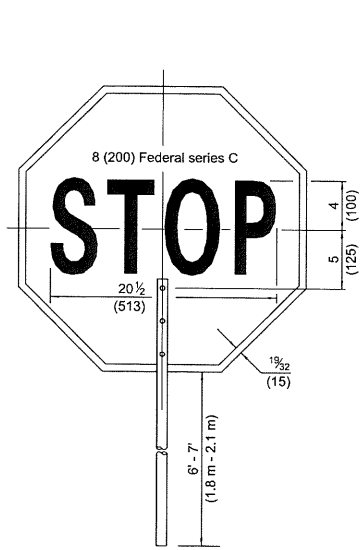
This sign shall be used when the above sign assembly is used.



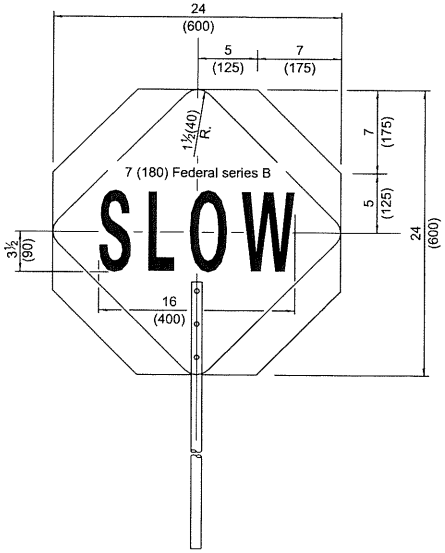
W12-I103-4848

WIDTH RESTRICTION SIGN

XX'-XX" width and X miles are variable.



FRONT SIDE



REVERSE SIDE

FLAGGER TRAFFIC CONTROL SIGN

HIGHWAY CONSTRUCTION SPEED ZONE SIGNS

**** R10-I108p shall only be used along roadways under the juristiction of the State.

Illinois Department of Transportation

APPROVED January 1, 2025
ENGINEER OF SAFETY PROG. AND ENGINEERING

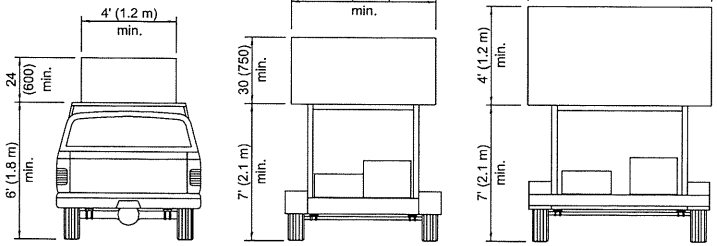
APPROVED January 1, 2025
ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-13

TRAFFIC CONTROL DEVICES

(Sheet 2 of 3)

STANDARD 701901-10

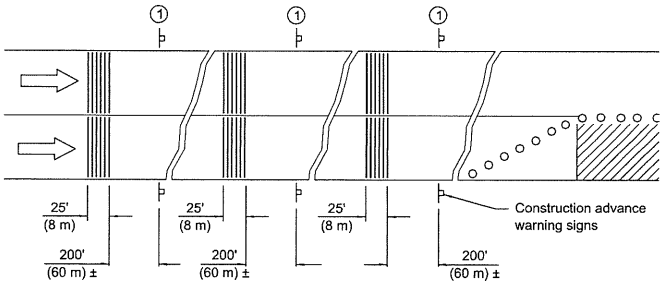


TYPE A ROOF MOUNTED

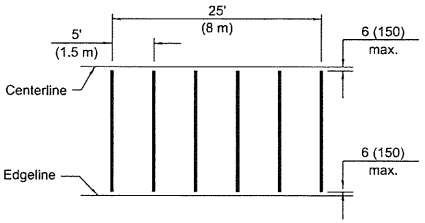
TYPE B ROOF OR TRAILER MOUNTED

TYPE C TRAILER MOUNTED

ARROW BOARDS

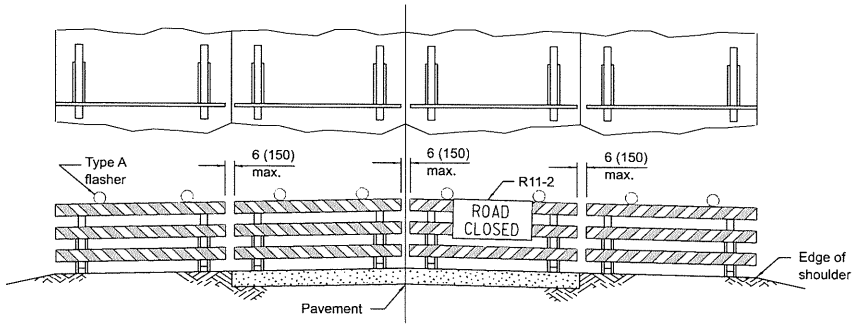


① This sign shall be omitted when median width is less than 10' (3 m).



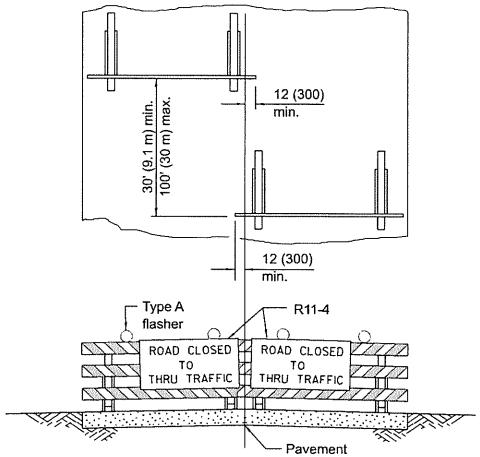
TYPICAL INSTALLATION

TEMPORARY RUMBLE STRIPS



ROAD CLOSED TO ALL TRAFFIC

Reflectorized striping may be omitted on the back side of the barricades.



ROAD CLOSED TO THRU TRAFFIC

Reflectorized striping shall appear on both sides of the barricades.

Illinois Department of Transportation

APPROVED January 1, 2025
ENGINEER OF SAFETY PROG. AND ENGINEERING

APPROVED January 1, 2025
ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-13

TYPICAL APPLICATIONS OF TYPE III BARRICADES CLOSING A ROAD

If a Type III barricade with an attached sign panel which meets NCHRP 350 or MASH is not available, the sign may be mounted on an NCHRP 350 or MASH temporary sign support directly in front of the barricade.

TRAFFIC CONTROL DEVICES

STANDARD 701901-10

- PERMIT NO. 7D-34581 ROUTE IL 1

Illinois Department of Transportation

Utility Permit

IDOT Public Improvement ☐ Yes ☒ No

IDOT Permit No. 7D-34581

Utility Reference No. 411D 00 RPWC IL 1

Name of Applicant	E-mail
I (We) Robinson Palestine Water Commission	jason.wesner@frontier.com

Mailing Address	City	State	Zip Code
108 East Poplar Street	Robinson	IL	62454

hereinafter termed the Permittee, request permission and authority to occupy, and to do certain work herein described on, the right-of-way of the State highway known as Illinois Rte. 1 - FAP 332, Section 31 - Township 7 North - Range 11 West 21Y 21X B-1, in Crawford County.

Latitude/Longitude Begin 216+90 End 217+20

The work is described in detail below and/or on the attached sketch or plans.

The work includes constructing a 12" finished water main that will cross Illinois Route 1 - FAP Route 332. The 12" water main will cross Illinois Route 1 - FAP Route 332 along station 1+00 to 1+74 and 30+00 to 30+74. This work is a part of the construction of a new water treatment plant.

This work is located east of Robinson and north of Gordon Junction approximately 910' north of IL 1.

This permit covers the operation and presence of specified equipment, material or facility on the right-of-way that may be related to the authorized work. A copy of this permit must be present when crews or equipment occupy highway right-of way. Failure to comply may result in the cessation of all construction.

This permit is subject to conditions and restrictions of Part 530 of Title 92 of the Illinois Administrative Code, Accommodation of Utilities on Right-of-Way of the Illinois State Highway System. The removal, relocation or modification of facilities permitted to occupy the right-of-way is governed by Section 9-113 of the Illinois Highway Code, as amended by Public Act 92-0470. The Permittee agrees to comply with the requirements of these laws and with all terms and conditions established by this permit. This permit is subject to revocation by the Department on violation of the terms and conditions governing its use.

IDOT is accepting the GPS points as an approximation. ROW, dimensions, and GPS are not reviewed for accuracy.
It is the applicant's responsibility to place utilities at the allowable utility corridor line, or as close to ROW line as possible. Utilities can be no farther away from the ROW line than 8'. No utilities are allowed in the sidewalk, shoulder, foreslope, under culverts, or the bottom of the ditch.

All appurtenances must be installed within 1' of the ROW line or corridor line. Hand holes, valves, markers, pedestals, boxes, etc. must be installed flush with the surrounding ground elevation, be heavy-duty, and have a minimum load rating of 20,000 lbs. Tier 15 or 22 depending on the location according to the current IDOT handhole specifications.

Utilities must follow a predictable path and be at a ninety-degree (90°) angle under or over the roadway surface.
All bores will need to be a minimum of 36" under the lowest elevation across the ROW for conventional highways. Utilities need to be installed a minimum of 10' away from culverts.
All disturbed sidewalks must be returned to current A.D.A. Standards. Provided information does not give variance to the permit specifications, standards, and provisions. Variances must be explicitly requested and approved.
ANY VARIATIONS FROM THE POLICY GUIDELINES REQUIRES PRIOR APPROVAL!

Permittee Signature & Date: Jason A. Wesner 10/16/24

Name of Permitee or Agent (Print or Type): Jason Wesner, Manager

Mailing Address: 108 East Poplar Street

City	State	Zip Code
Robinson	IL	62454

The work authorized by this permit shall be completed by 07/31/25 or within 180 calendar days (180 days max.) after the date of approval by the Department, otherwise the permit will be considered null and void.

Public Improvement Projects only: The anticipated letting date is _____

The permit allowing occupancy and work on state right-of-way is approved. The Utility Coordination Council established by the Department in the area covered by this permit is the district in which the permit was issued.

Regional Engineer or Designee Signature & Date: Jeffrey P Myers 11/14/24

Illinois Department of Transportation

Utility Permit

IDOT Public Improvement ☐ Yes ☒ No

IDOT Permit No. 7D-34581

Utility Reference No. 411D 00 RPWC IL 1

I (We) Name of Applicant: Robinson Palestine Water Commission

E-mail: jason.wesner@frontier.com

Mailing Address: 108 East Poplar Street

City: Robinson

State: IL

Zip Code: 62454

hereinafter termed the Permittee, request permission and authority to occupy, and to do certain work herein described on, the right-of-way of the State highway known as Illinois Rte. 1 - FAP 332, Section 31 - Township 7 North - Range 11 West 21Y 21X B-1,

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Latitude/Longitude Begin 216+90 End 217+20

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All disturbed sidewalks must be returned to current A.D.A. Standards. Provided information does not give variance to the permit specifications, standards, and provisions. Variances must be explicitly requested and approved.
ANY VARIATIONS FROM THE POLICY GUIDELINES REQUIRES PRIOR APPROVAL!

Permittee Signature & Date: Jason A. Wesner 10/16/24

Name of Permitee or Agent (Print or Type): Jason Wesner, Manager

Mailing Address: 108 East Poplar Street

City: Robinson State: IL Zip Code: 62454

The work authorized by this permit shall be completed by 07/31/25 or within 180 calendar days (180 days max.) after the date of approval by the Department, otherwise the permit will be considered null and void.

Public Improvement Projects only: The anticipated letting date is _____

The permit allowing occupancy and work on state right-of-way is approved. The Utility Coordination Council established by the Department in the area covered by this permit is the district in which the permit was issued.

Regional Engineer or Designee Signature & Date

This permit is subject to the conditions and restrictions **established in accordance with the Illinois Highway Code and** Part 530 of Title 92 of the Illinois Administrative Code including but not limited to the following:

(1) The applicant represents all parties in interest and shall furnish material, do all work, pay all costs and shall in a reasonable length of time restore the damaged portions of the highway to a condition similar or equal to that existing before the commencement of the described work, including any landscape restoration necessary. (See Section 530.250 of Title 92).

(2) The proposed work shall be located and constructed to the satisfaction of the Regional Engineer or his duly authorized representative. No revisions or additions shall be made to the proposed work on the right-of-way without the written permission of the Regional Engineer or his duly authorized representative (See Section 530.200 of Title 92). **In certain circumstances the Department may require that the construction plans and/or the as-built documents be sealed by an Illinois Registered Professional Engineer.** Typical of such projects would be petroleum or gas pipelines.

(3) The applicant shall at all times conduct the work in such a manner as to minimize hazards to vehicular and pedestrian traffic. All signs, barricades, flaggers, etc., required for traffic control shall be furnished by the applicant. (See Section 530.240 of Title 92).

(4) The applicant must ascertain the presence of Highway Authority Agreements established in accordance with 35 Ill. Admin. Code Section 742.1020 in the path of its proposed installation and take precautions to protect its workers, human health and the environment in those areas. (See Section 530.240 of Title 92). Where contamination is encountered through excavation in the ROW, it should be managed offsite and IDOT's generator number for the appropriate county may be used.

(5) The applicant shall not trim, cut or in any way disturb any trees or shrubbery along the highway without the approval of the Regional Engineer or his duly authorized representative. (See Section 530.600 of Title 92).

(6) The facilities authorized to occupy the right-of-way by this permit are subject to removal, relocation or modification by the permittee at no expense to the State on notice given by the Department in accordance with Section 9-113 of the Illinois Highway Code, as amended. Participation by the permittee in the UTILITY Coordination Council identified on page one of this permit is required as a condition of this permit. Permittee shall cooperate with the Department with the scheduling of any removal, relocation or modification deemed necessary for highway or highway safety purposes, and, if Utility Coordination Council participation is required by this permit, with the activities of the council identified on the first page of this permit. (See Section 9-113 of the Illinois Highway Code.) Use of and compliance with current IDOT Traffic Control Standards will be required.

(7) If the applicant and the District cannot agree either on whether the permit should be issued or on what conditions would be appropriate, the applicant may, within 30 days of the issuance of written notice of the District's position, appeal the District's determination to the Chief of the Department's Central Bureau of Operations. (See Section 530.900 of Title 92).

(8) The permittee agrees to fully comply with the following legal obligations in advance of entering and while upon any Right-of-way within the Illinois State Highway System.

a) Only a permit issued by the Department under this Part will satisfy the "written consent" requirement of Section 9-113 of the Illinois Highway Code (the Code).

b) A permit from the Department grants a license only to undertake certain activities in accordance with this Part on a State right-of-way, and does not create a property right or grant authority to the permittee to impinge on the rights of others who may have an interest in the right-of-way. Such others might include an owner of an underlying fee simple interest if the right-of-way is owned as an easement or dedication of right of way, an owner of an easement, or another permittee.

c) It shall be the responsibility of the permittee to ascertain the presence and location of existing above-ground or underground facilities on the highway right-of-way to be occupied by their proposed facilities. The Department will make its permit records available to a permittee for the purpose of identifying possible facilities. When notified of an excavation or when requested by the Department, a permittee shall locate, physically mark, and indicate the depth of its underground facilities within 48 hours excluding weekends and holidays.

d) The permittee shall avoid conflicts with any existing underground or above-ground facilities on or near the highway right-of-way. Both the Department and J.U.L.I.E. are to be contacted for assistance during the application process.

e) The permittee shall comply with all other applicable laws relating to the placement of utility lines.

f) The issuance of a utility permit by the Department does not excuse the permittee from complying with any existing statutes, local regulations or requirements of other Department (e.g., oversize and overweight vehicles) or the requirements of other State agencies including, but not limited to, the following:
Illinois Commerce Commission, Illinois Department of Agriculture
Illinois Department of Natural Resources, Illinois Department of Mines and Minerals
Illinois Environmental Protection Agency, Illinois Historic Preservation Agency

g) Rights of abutting and underlying property owners are protected by common law and Sections 9-113 and 9-127 of the Code. The permittee will address these rights prior to initiating activities on State right-of-way. The Department will not be a party in any negotiations between the utility and abutting property owners.

h) In no case shall the permit give or be construed to give an entity any easement, leasehold or other property interest of any kind in, upon, under, above or along the State highway right-of-way.

i) Each person responsible for a utility, in place on the effective date of this Part, on a State highway right-of-way shall notify the Department in writing, if that facility does not comply with this Part. The Department shall treat such a notice as a request for a variance under Section 530.130. Until informed that a variance will not be granted, a person responsible for a pre-existing utility will not be in violation of this Part. The failure to provide such notice constitutes a violation of this Part and of the utility accommodation permit (if any) and would justify the imposition of the sanctions set forth in Section 530.810.

Work to be coordinated with Department Reps:

Department Rep 1	Phone
Elly Osborne **(Utility Permits)** Office Phone 217- 342-8310	Cell Phone 217-246-4070
Department Rep 2	**Phone**
Patrick Kennedy **(Utility Permits)** Office Phone 217- 342-8338	Cell Phone 217-836-4250
Utility Contact Person/E-mail	**Phone**

Work to be done by:

Contractor

Daytime Phone	Emergency Phone

Traffic control operation:

Number of lane closures	Time of closures

PERMIT STATUS SHEET

2024

Reference Number: 00 RPWC IL 1

Permit Number: 7D-34581 Date: _____

County: Crawford Route: IL 1

(CHECK ONE)

*** To be completed when requesting an extension.**

☐ Complete and ready for inspection. Date completed: _____

☐ Proposed work cancelled.

☐ Work started, but incomplete. Requesting an extension of time until: _____

☐ Time extension requested until: _____

*Reason for Extension: _____

_____

_____

Was the permit completed to permit specifications? ☐ Yes ☐ No

If no, please submit as-built plans with status sheet.

Do not request an inspection until a grass turf has been re-established and all necessary paperwork (as-built plans) have been returned.

Name: _____ _____
Representative Phone Number

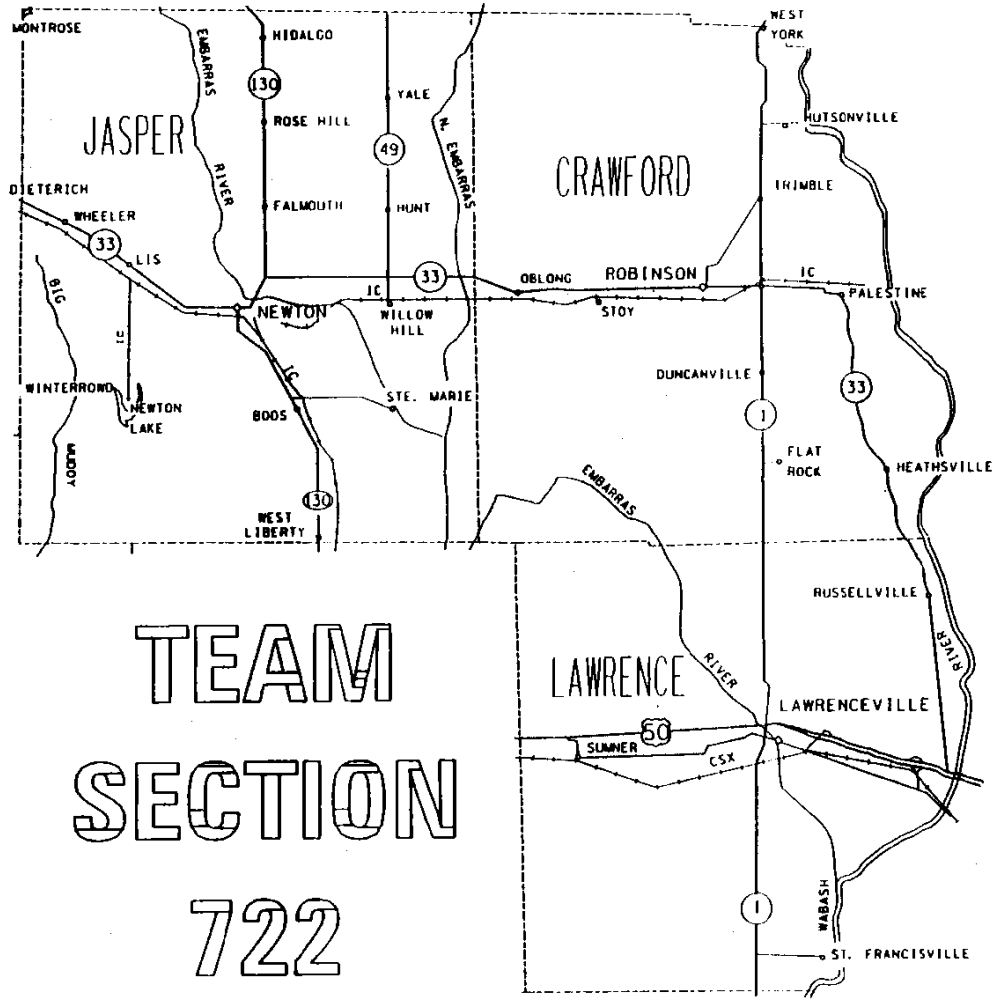
Change of Address: _____
(if applicable) Street Address

_____ _____ _____
City State Zip

PLEASE FILL OUT AND RETURN TO:

Mail: Illinois Department of Transportation
Utility Permits Unit
400 West Wabash Avenue
Effingham, Illinois 62401

E-mail: Dot.D7.Permits@illinois.gov



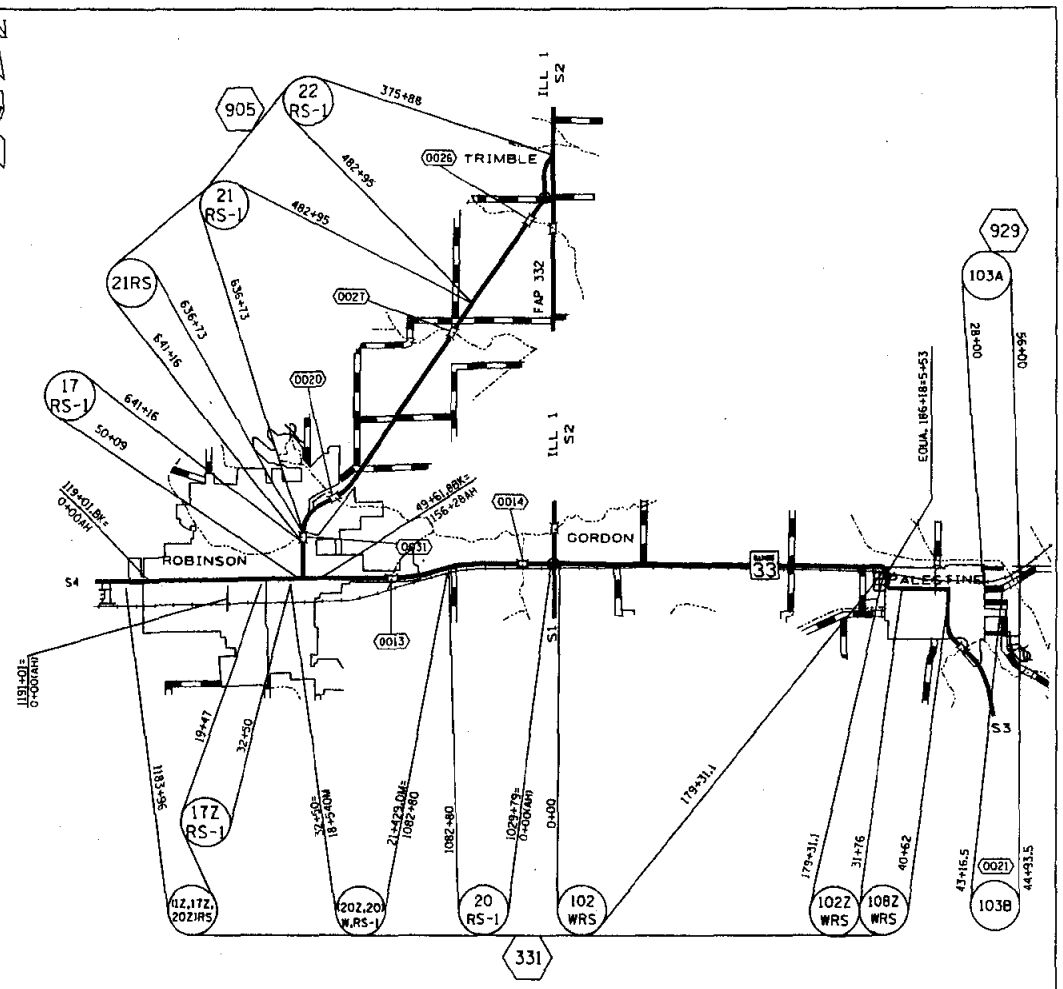
TEAM SECTION 722

6ZM722

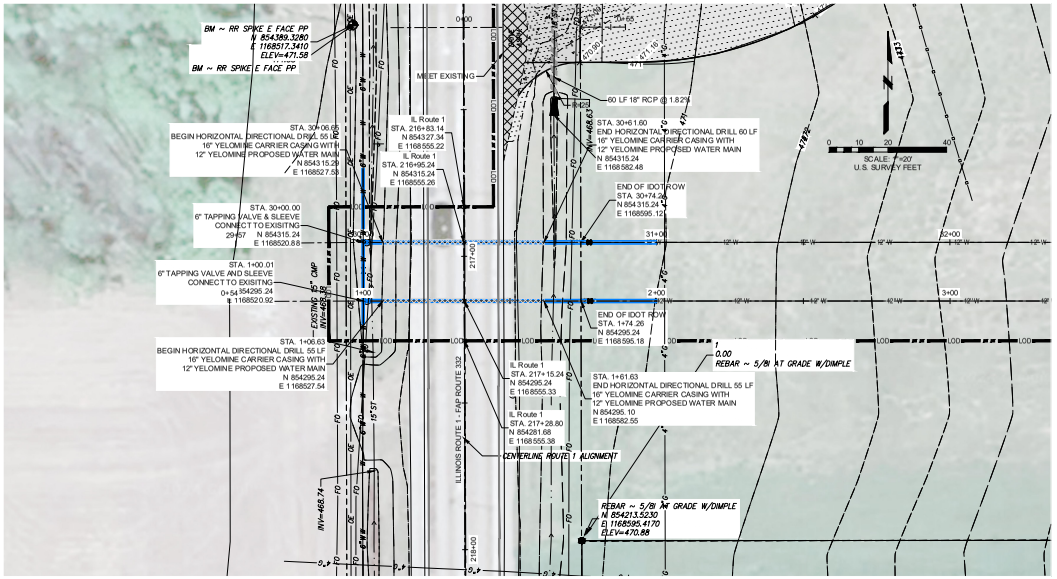
DISTRICT 7 MAINTENANCE TEAM SECTION 722

MARKED ROUTE	CONSTRUCTED AS ROUTE	CONSTRUCTED AS SECTION	YEAR	SLAB SECTION	WIDTH	SUB-SECTION	CENTERLINE MILES	MICRO-FILM
ILL 33	SBI 33	11, 17)RS & 20 ZRS	1974	6" [-11	40', 50', & 73.4' **	331	0.5023	T-75
ILL 33	SBI 33	20-RS-1	1970	9"-6"-9" 6" [-11	22'	331	1.0039	T-61
ILL 33	SBI 163	102-WRS	1974	9"-6"-9" 5" [-11	24'	331	3.3960	T-75
ILL 33	SBI 163	102 Z, WRS	1971	9"-6"-9" 3" 1-11	24'	331	0.6260	T-62
ILL 33	SBI 181	108 Z, WRS	1971	9"-6"-9" 3" [-11	24'	331	0.1720	T-62
	SBI 163	103-A	1938	6 1/2" CR	20'	929	0.4956	T-21
	SBI 1	17-RS-1			27'& 29'*	905	0.3034	T-109
	SBI 1	21-RS	1956	9"-6"-9" 2" [-11	22'	905	0.0801	T-41
	SBI 1	22-RS-1	1985	9"-6"-9" 2" [-11	22'	905	2.0218	T-95
	SBI 163	103-B	1938	6 1/2"	27' 6"	929	0.0335	T-21
	SBI 33	17-Z-RS-1	1981	9" [-11 1" SAND	40', 50', 74'	331	0.2492	T-90
	SBI 1	21 RS-1	1985	9"-6"-9"	22'	331	2.9926	T-95
ILL 33	FAI 781	(20Z, 20) WRS-1	2000	9"- 6"- 9" 2 1/2" CL- 1	30'-30.5' VAR.	331	1.8200	
					TOTAL THIS SHEET		13.7024	
					COUNTY		CL MILES	

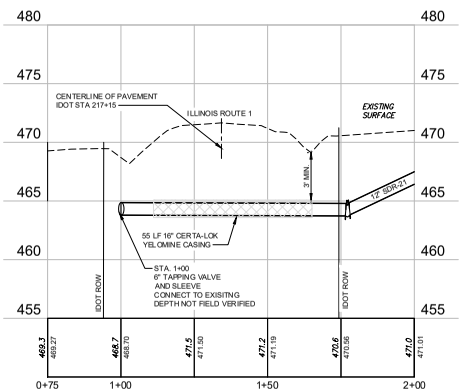
REVISED
02/28/02 I. Smith



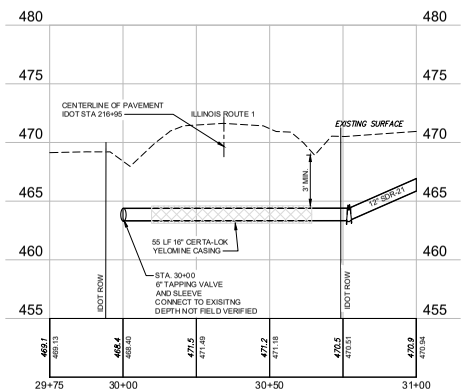
COUNTY CODE 017
SHEET NO. 5 MAINTENANCE TEAM SECTION 722



1 **PROPOSED WATER MAIN PLAN**
SCALE: 1"=20'



12" WATER MAIN - STA. 1+00 TO STA. 2+00



12" WATER MAIN - STA. 30+00 TO STA. 31+00

ILLINOIS ROUTE 1 - 12" WATER MAIN CROSSINGS

1 **PROPOSED WATER MAIN PROFILE**
SCALE: H 1"=20' V 1"=5'

NOTES:

1. CONTRACTOR SHALL COMPLETE WORK IN ACCORDANCE WITH IDOT REQUIREMENTS AND PERMIT.
2. THE STANDARD SPECIFICATIONS FOR WATER AND SEWER MAIN CONSTRUCTION IN ILLINOIS 8TH EDITION SHALL APPLY TO THIS WORK.
3. WATER SUPPLIES SHALL BE PROTECTED PER SECTION 370.350 OF THE ILLINOIS RECOMMENDED STANDARDS FOR SEWAGE WORKS.
4. HORIZONTALLY DIRECTIONALLY DRILLED WATER MAIN PIPE SHALL BE CERTA-LOC YELOMINE PIPE: ASTM D2241 (RESTRAINED JOINT) SDR-21 OR APPROVED EQUAL WITH MINIMUM PRESSURE RATING OF 200 PSI AND MINIMUM WALL THICKNESS OF 0.606 AS PER SPECIFICATION.
5. WATER MAIN SHALL BE PRESSURE TESTED WITH WATER AT 100 PSI FOR ONE HOUR WITHOUT LEAKAGE.
6. CONTRACTOR SHALL POTHOLE ALL UTILITIES PRIOR TO START OF WORK TO VERIFY LOCATION AND ELEVATION.
7. CONTRACTOR RESPONSIBLE FOR DETERMINING SUB SOIL CONDITION PRIOR TO BIDDING AND MAKING CONSIDERATION IN THE BID FOR SUCH.
8. DEVIATION FROM DRILL PATH SHALL NOT EXCEED 5% OF PLAN DEPTH OVER A 100' DISTANCE.
9. ALL MECHANICAL JOINTS SHALL BE RESTRAINED.
10. ABANDONED PIPE TO BE CAPPED AND GROUTED.

<u>ILLINOIS DEPARTMENT OF TRANSPORTATION REQUIREMENTS:</u>

HORIZONTALLY DIRECTIONAL DRILL THE FOLLOWING REQUIREMENTS MUST BE MET:

- PROVIDE SITE-SPECIFIC BORING DATA OR CONE PENETROMETER TESTING WHICH INCLUDES THE SOIL CLASSIFICATION AND BEARING CAPACITY OF THE SOIL IN THE DRILLING LOCATION.
- PROVIDE A CROSS SECTION AND SUMMARY OF THE DIRECTIONAL BORING PROCESS PROPOSED, INCLUDING PILOT HOLE SIZE, ANTICIPATED OVERBORE DIAMETER, RELIEF HOLE LOCATIONS AND THE NUMBER OF PASSES ANTICIPATED TO ENLARGE THE PILOT HOLE TO THE NECESSARY OVERBORE DIAMETER.
- PROVIDE INFORMATION ON THE REAMING MACHINE AND DRILLING FLUID/MUD MIXTURE PROPOSED FOR USE AT EACH DRILLING LOCATION.

FURTHER, DURING INSTALLATION, WE REQUEST THAT THE FOLLOWING GUIDELINES BE FOLLOWED:

- IDOT SHALL BE NOTIFIED A MINIMUM OF TWO (2) WEEKS PRIOR TO COMMENCEMENT OF WORK AND SHALL BE PROVIDED WITH APPROXIMATE WORK DATES.
- A 6-INCH PILOT HOLE IS REQUIRED FOR ALL DIRECTIONAL BORING.
- DIRECTIONAL BORES IN EXCESS OF THE 6 INCH PILOT HOLE SHALL BE ENLARGED USING MULTIPLE PASSES.
- BACKREAMING OF THE BORE IS REQUIRED.
- OVERBORE SHALL BE 25-50% GREATER THAN THE CASING OR CARRIER PIPE DIAMETER.
- RELIEF HOLES ARE REQUIRED.

Farnsworth GROUP
400 WEST JEFFERSON, SUITE A
EFFINGHAM, ILLINOIS 62401
(217) 531-1253 / info@f-w.com
www.f-w.com
Engineers | Architects | Surveyors | Scientists

ISSUE:

#	DATE:	DESCRIPTION:

PERMIT REVIEW
NOT FOR CONSTRUCTION

PROJECT:
Robinson-Palestine Water Commission

Water Treatment Plant and Campus

10711 N. State Highway 1
Robinson, IL 62454

DATE:	10/04/2024
DESIGNED:	ACH
DRAWN:	GAB/BMH
REVIEWED:	ACH
FIELD BOOK NO.:	-

SHEET TITLE:
WATER MAIN PLAN & PROFILE

RTE. 1 IDOT CROSSINGS

SHEET NUMBER:
C1

PROJECT NO.: 0210007.00

I:\Shared\ | J:\2021\0210007.00 - RPWC Route 1 Water Treatment Plant\SA-Drawings\02MCD\Rte 1 & Finished Water Main Relocation - 0210007.00 IDOT Submittal.dwg | 11/12/2024 3:58 PM |

Soil Map—Crawford County, Illinois
(RPWC WTP WM - IL Rte. 1)



Map Scale: 1:243 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 3 7 14 21

Feet
0 10 20 40 60

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Crawford County, Illinois
Survey Area Data: Version 21, Aug 28, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 24, 2020—Dec 9, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

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This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Crawford County, Illinois
Survey Area Data: Version 21, Aug 28, 2023

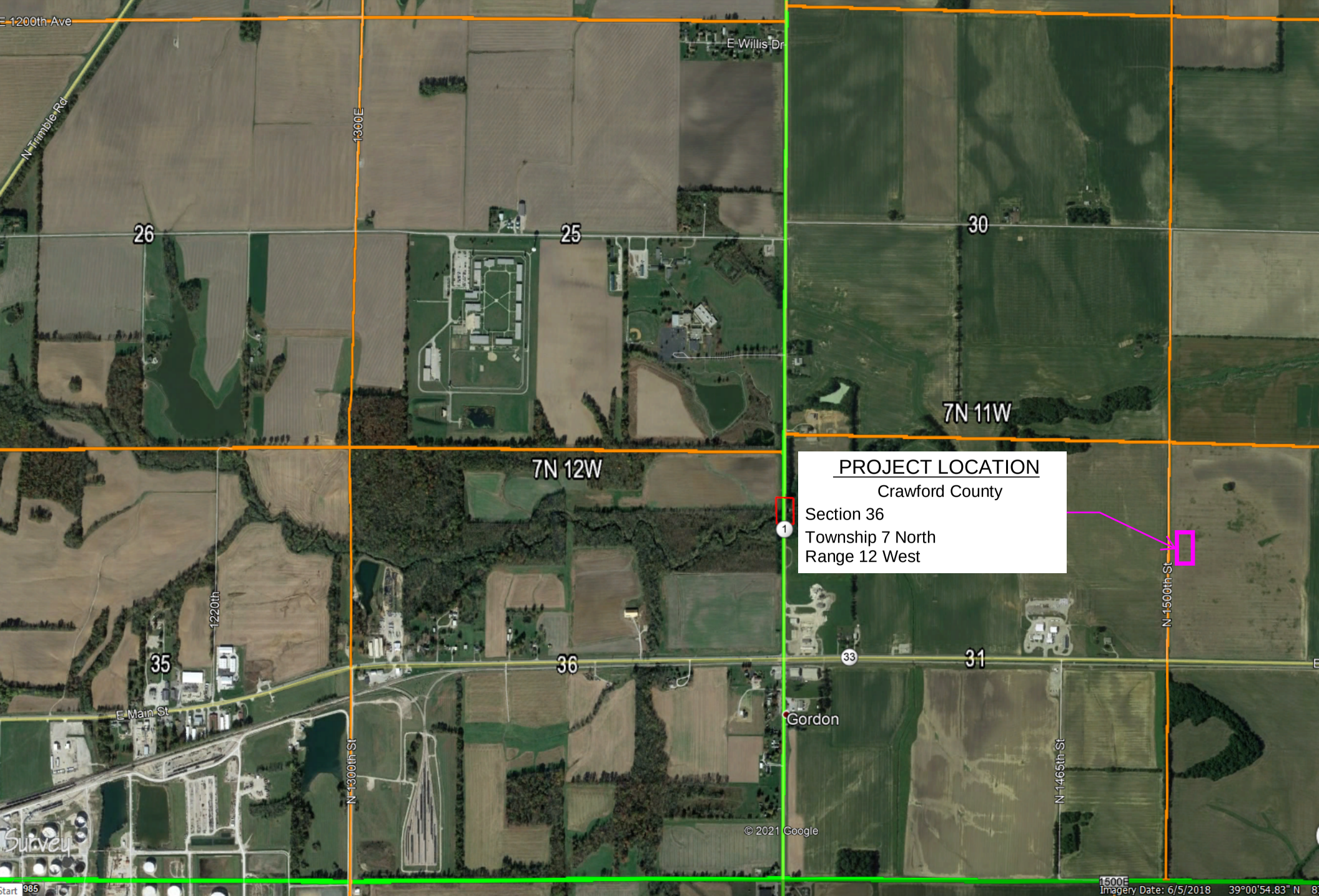
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 24, 2020—Dec 9, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3070A	Beaucoup silty clay loam, 0 to 2 percent slopes, frequently flooded	0.3	100.0%
Totals for Area of Interest		**0.3**	**100.0%**


E 1200th Ave
N Trimble Rd
1300E
E Willis Dr
26
25
30
7N 11W
7N 12W
PROJECT LOCATION
Crawford County
Section 36
Township 7 North
Range 12 West
1
N 1500th St
1220th
35
36
33
31
E Main St
Gordon
N 1300th St
N 1465th St
© 2021 Google
Survey
1500E
Imagery Date: 6/5/2018
39°00'54.83" N

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
332	(21-Y, 21-X)B-1	CRAWFORD	3	1
	ILLINOIS	CONTRACT NO. 74181		

STATE OF ILLINOIS

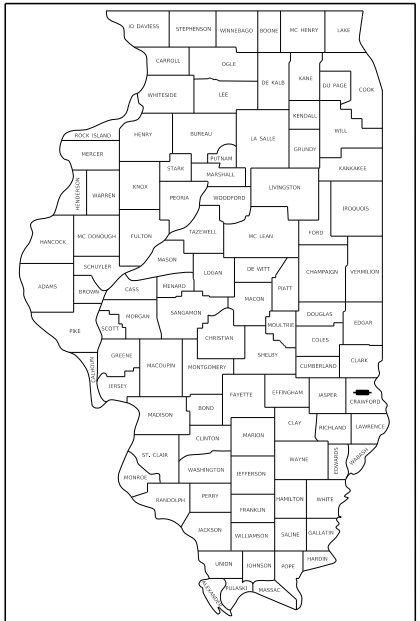
DEPARTMENT OF TRANSPORTATION

PROPOSED
RIGHT OF WAY PLANS

FAP ROUTE 332 (IL 1)
SECTION (21–Y, 21–X)B–1
PROJECT NHPP–WW8R(125)
CRAWFORD COUNTY

R–97–003–18

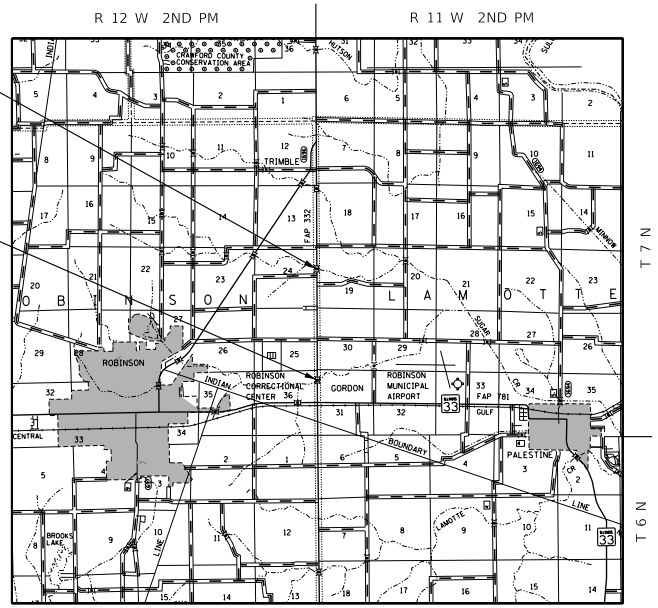
D–97–054–06



LOCATION OF SECTION INDICATED THUS: – ■ –

FAP ROUTE 332
SECTION (21–Y, 21–X)B–1
CRAWFORD COUNTY
STATIONS 110+00 TO 118+00

FAP ROUTE 332
SECTION (21–Y, 21–X)B–1
CRAWFORD COUNTY
STATIONS 204+00 TO 215+00



100' 200' 300' — 1" = 100'
0 10' 20' 30' — 1" = 10'
0 50' 100' — 1" = 50'
0 50' 100' — 1" = 40'
0 50' 100' — 1" = 30'
0 50' 100' — 1" = 20'

FULL SIZE PLANS HAVE BEEN PREPARED USING STANDARD ENGINEERING SCALES. REDUCED SIZED PLANS WILL NOT CONFORM TO STANDARD SCALES. IN MAKING MEASUREMENTS ON REDUCED PLANS, THE ABOVE SCALES MAY BE USED.

J.U.L.I.E.
JOINT UTILITY LOCATION INFORMATION FOR EXCAVATION
1–800–892–0123
OR 811

GROSS LENGTH = 1900.00 FT. = 0.360 MILE
NET LENGTH = 1900.00 FT. = 0.360 MILE

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

SUBMITTED _____ 20 _____
DEPUTY DIRECTOR OF HIGHWAYS, REGION ENGINEER

EXAMINED _____ 20 _____
CHIEF OF PLATS AND PLANS

PASSED _____ 20 _____
DISTRICT LAND ACQUISITION ENGINEER

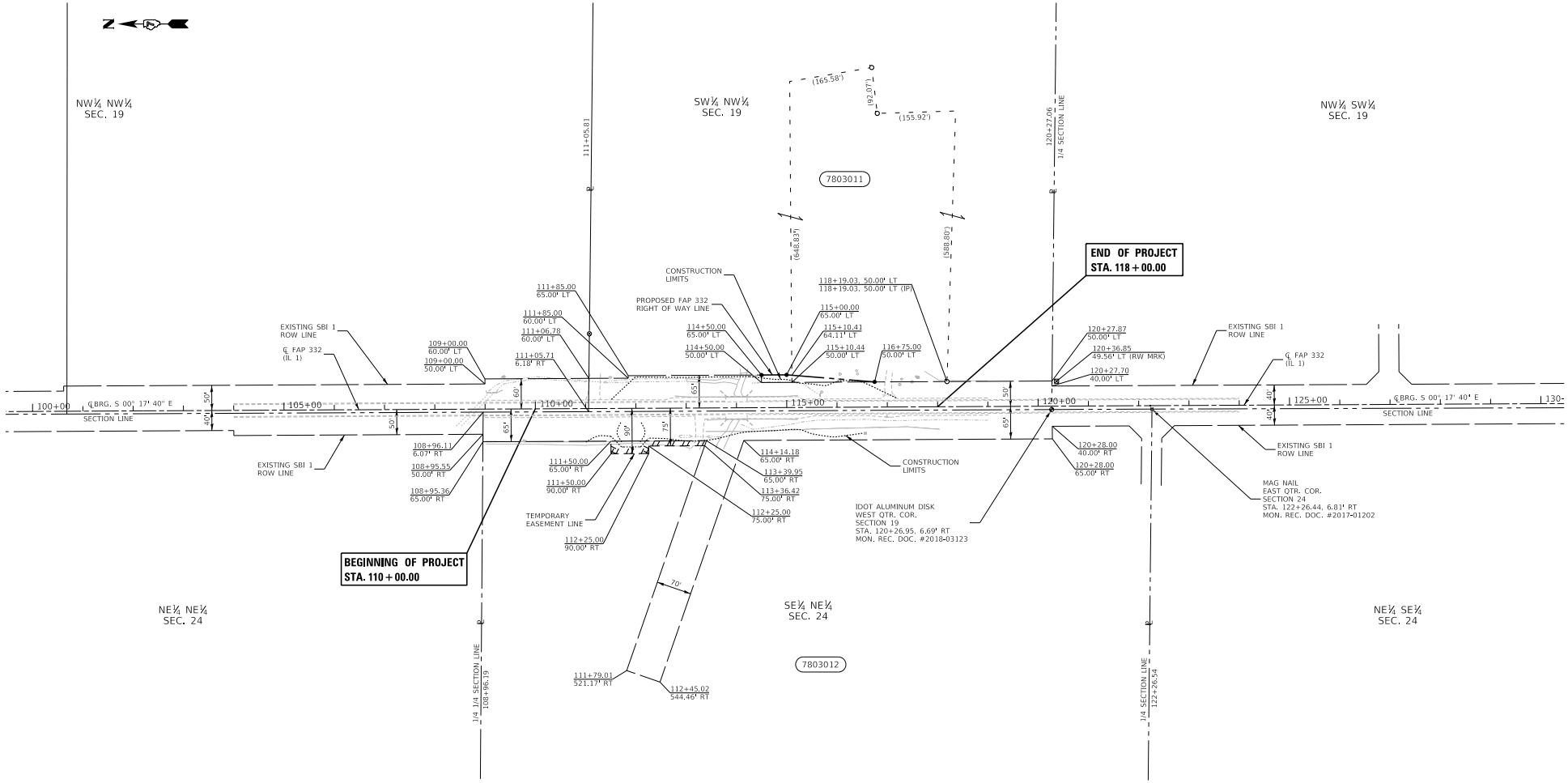
REVIEWED _____ 20 _____
CENTRAL BUREAU RIGHT OF WAY PLANS ENGINEER

APPROVED _____ 20 _____
ENGINEER OF LAND ACQUISITION

PRINTED BY THE AUTHORITY OF THE STATE OF ILLINOIS

CONTRACT NO. 74181

T.7N.–R.11W., 2nd P.M., LA MOTTE NORTH TWP.



T.7N.–R.12W., 2nd P.M., ROBINSON NORTH TWP.

- O - EXISTING IRON PIN
- ⊕ - IDOT ALUMINUM DISK
- ▪ - EXISTING MAG NAIL
- ● - SET IRON PIN
- ⊠ - EXISTING R.O.W. MARKER
- ⊗ - EXISTING FENCE POST
- (R) RECORDED DISTANCE

NOTE:
BEARINGS ARE REFERENCED TO THE ILLINOIS STATE PLANE COORDINATE SYSTEM EAST ZONE DATUM OF 1983(97)

TEMPORARY EASEMENTS NEEDED FOR A WORK AREA

PARCEL	OWNER	AREA TAKEN ADD	AREA TAKEN EXIST	EASEMENT	REM. AREA	INST	RECORDED MICRO FILM NO.	RECORDED DATE	RECORDED BOOK	RECORDED PAGE	EXCESS AREA	EXCESS SOLD
7803011	THOMAS E. & JERRI L. TITSWORTH	0.047 AC.	1.303 AC.		21.549 AC.							
7803012	JOHN P. & SUE E. TRIMBLE, TRUSTEES			0.069 AC.								

USER NAME = davidson[m	DESIGNED - LRF	REVISED -	
	DRAWN - JMD	REVISED -	
PLOT SCALE = 100.0000 ' / In.	CHECKED - BAB	REVISED -	
PLOT DATE = 8/6/2019	DATE - 08/05/2019	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

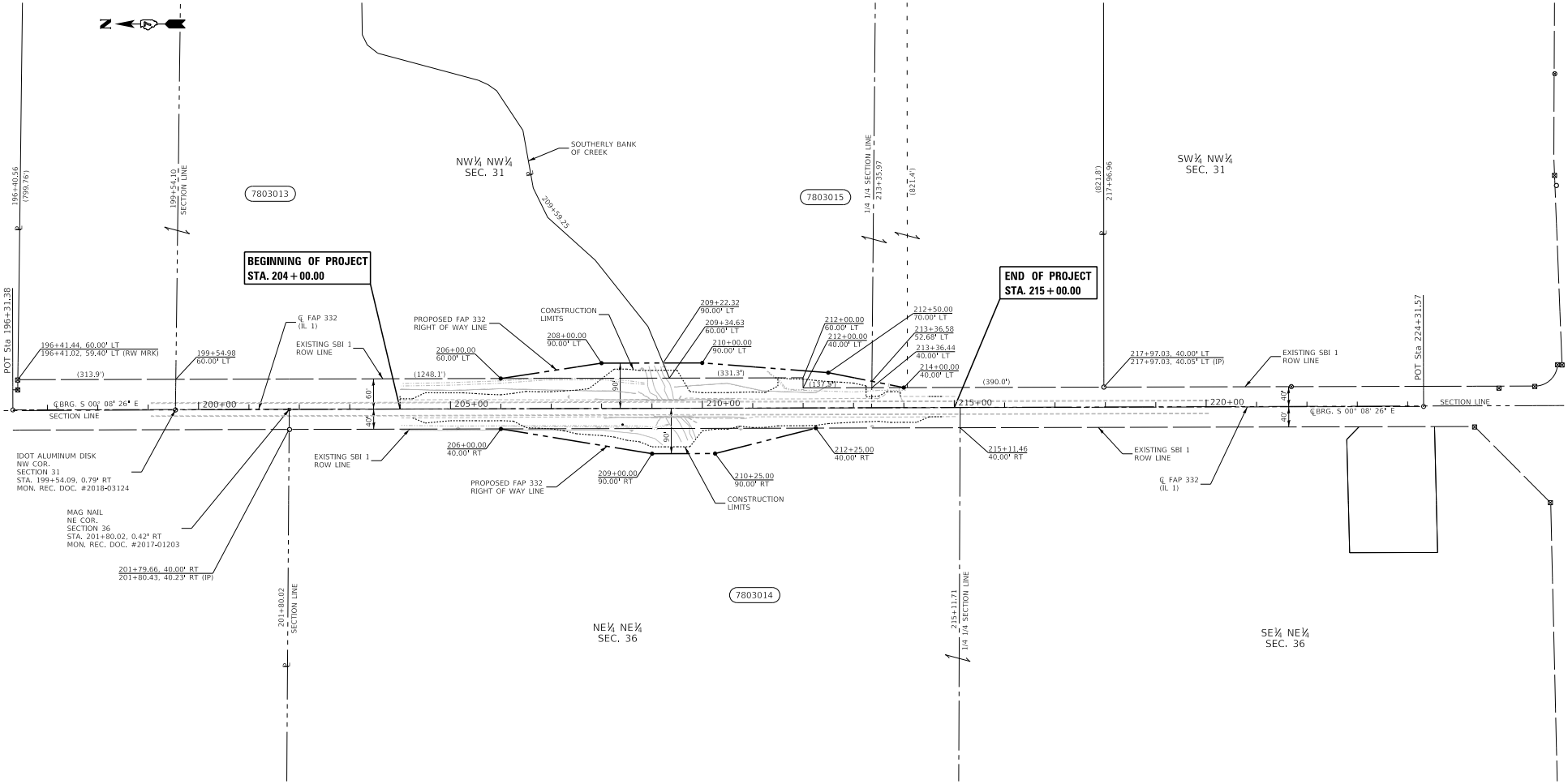
RIGHT OF WAY PLANS

	PROJECT	JOB NO. R-97-003-18
SCALE: 1" = 100'	SHEET 2 OF 3 SHEETS	STA. 100+00 TO STA. 130+00

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
332	(21-Y, 21-X)B-1	CRAWFORD	3	2
		CONTRACT NO. 74181		
FED. ROAD DIST. NO.	ILLINOIS	FED. AID PROJECT		

MODEL: Default
FILE NAME: pw:\\dgnmrsv.dot.illinois.gov:\WIDOT\Documents\DOT Offices\Rockford - Projects\74181\CADData\LandXml\s0774181-sht-rowplan.dgn

T.7N.–R.11W., 2nd P.M., LA MOTTE SOUTH TWP.



T.7N.–R.12W., 2nd P.M., ROBINSON SOUTH TWP.

- ○ - EXISTING IRON PIN
- ⊙ - IDOT ALUMINUM DISK
- ▪ - EXISTING MAG NAIL
- ● - SET IRON PIN
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TEMPORARY EASEMENTS NEEDED FOR A WORK AREA

PARCEL	OWNER	AREA TAKEN ADD	AREA TAKEN EXIST	EASEMENT	REM. AREA	INST	RECORDED MICRO FILM NO.	RECORDED DATE	RECORDED BOOK	RECORDED PAGE	EXCESS AREA	EXCESS SOLD
7803013	PILGRIM HOLINESS CHURCH OF PALESTINE ILLINOIS	0.157 AC.	0.000 AC.		18.195 AC.							
7803014	JERRY LEE & BARBARA M. WILSON, TRUSTEES	0.430 AC.	1.223 AC.		194.334 AC.							
7803015	ROBINSON-PALESTINE WATER COMMISION	0.239 AC.	0.000 AC.		21.132 AC.							

USER NAME = davidson	m	DESIGNED - LRF	REVISED -
	DRAWN - JMD	REVISED -
PLOT SCALE = 100.0000 ' / In.	CHECKED - BAB	REVISED -
PLOT DATE = 8/6/2019	DATE - 08/05/2019	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

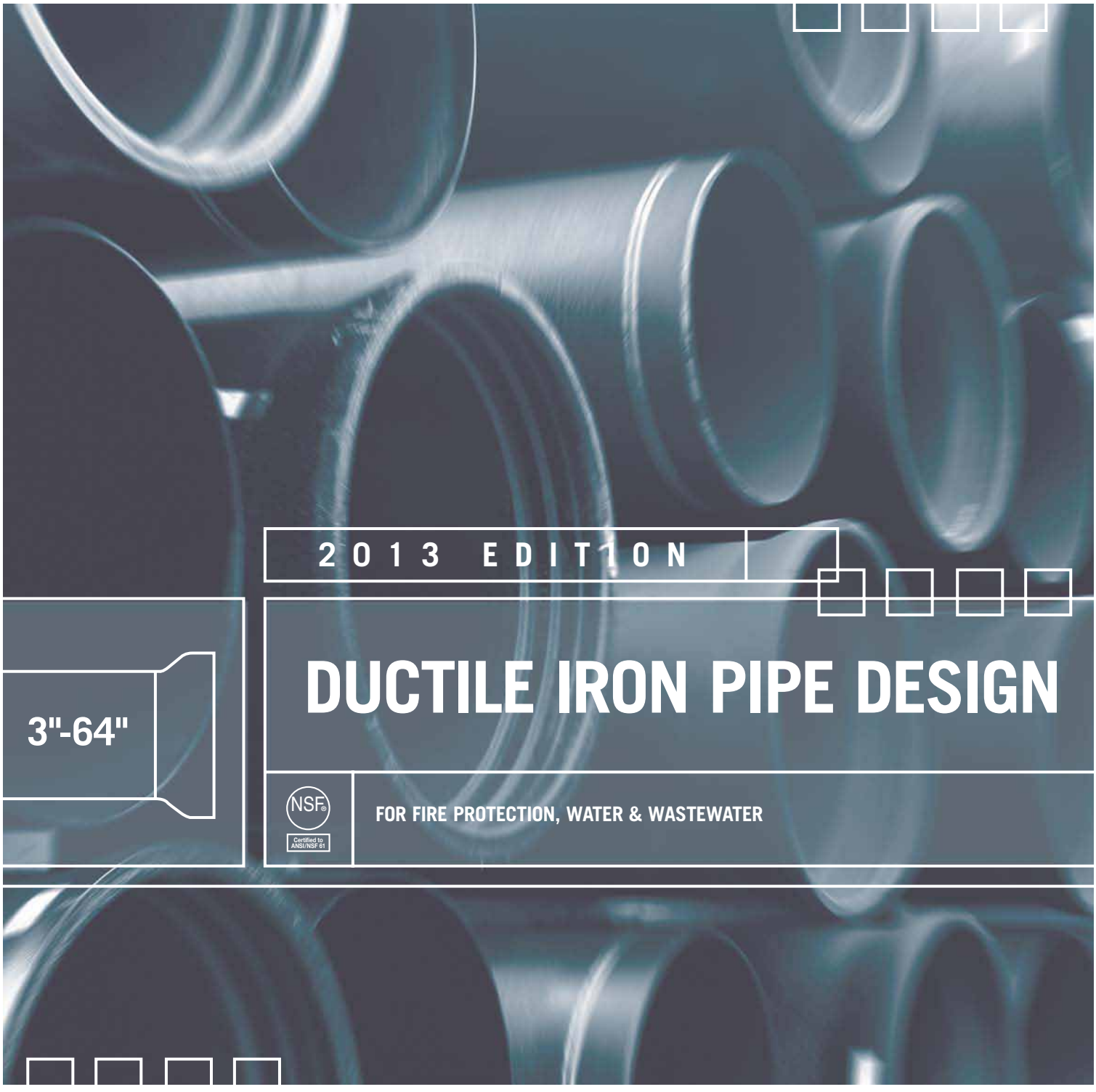
RIGHT OF WAY PLANS

	PROJECT		JOB NO. R-97-003-18	
SCALE: 1" = 100'	SHEET 3	OF 3 SHEETS	STA. 197+00	TO STA. 224+00

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
332	(21-Y, 21-X)B-1	CRAWFORD	3	3
		CONTRACT NO. 74181		
FED. ROAD DIST. NO.	ILLINOIS	FED. AID PROJECT		

MODEL: Default
FILE NAME: pw:\\dimension.dot.illinois.gov:WIPDOT\Documents\DOT Offices\Rockford - Projects\74181\CADData\LandXml\d0774181-cali-rowplan.dgn


PROJECT AREA
WATER MAIN
IDOT ALIGNMENT
STA. 207+00 TO 10+50
101-001
12.67
101-002
21.45
126-001
39.3
151-007
10.59
151-008
151-009
2.89
176-001
16.7
IL ROUTE 1 RIGHT-OF-WAY
IL 33 E 1050th AVE.
IL ROUTE 3
INRD RR
501-003
501-001
426-001
301-001



2013 EDITION

DUCTILE IRON PIPE DESIGN

3"-64"

NSF® Certified to ANSI/NSF 61

FOR FIRE PROTECTION, WATER & WASTEWATER

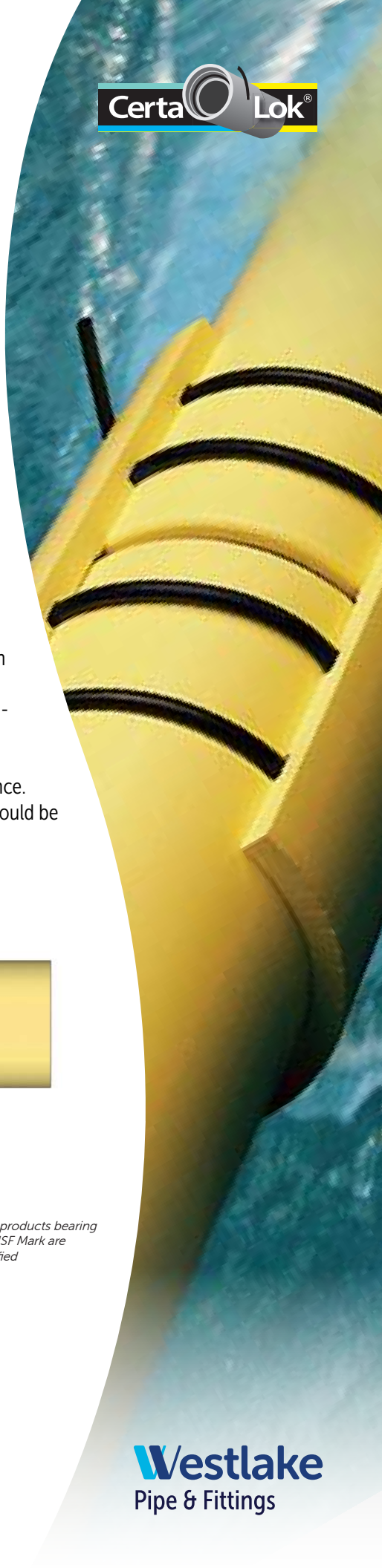
MORE THAN JUST PIPE.

U.S. PIPE

Municipal

PRODUCT SPECIFICATION

D2241/RJ CERTA-LOK® YELOMINE® PVC PRESSURE PIPE | Restrained Joint



Our D2241/RJ Certa-Lok Yelomine PVC Pressure Pipe is manufactured to meet the demands of today's municipal needs for water and wastewater applications. Certa-lok pipe utilizes precision-machined grooves on the pipe and in both sides of the coupling which, when aligned, allow a spline to be inserted, resulting a fully circumferential restrained joint. Flexible elastomeric gaskets in the coupling provide a hydraulic seal.

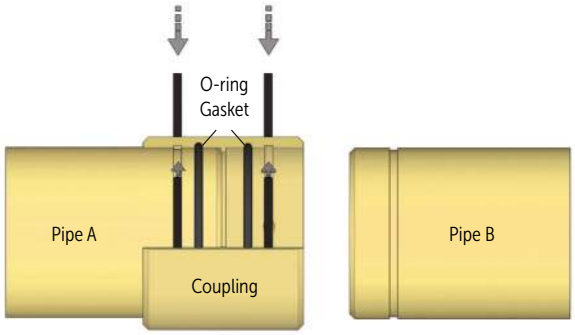
Trenchless & Restrained Joint Open-Cut Applications: This unique restrained joint pipe system is designed for trenchless applications with robust tensile strength for pulling multiple segments underground. This product reduces the jobsite footprint and minimizes community disruption with a reduced need for larger staging areas and traffic control.

Yelomine Formulation Enhancement for Aboveground and Temporary Bypass Applications: Yelomine products are manufactured from a specially formulated PVC compound that contains impact modifiers and UV inhibitors. This special formulation provides up to 6x the impact strength of normal PVC pipe over an extended period of time allowing for Yelomine products to be used aboveground and in high-impact situations like temporary bypass. Joints assembled with the non-permanent gasket option can be disassembled and reused for future jobs or system changes.

16" PR 200 psi couplings are manufactured from fibreglass and do not have enhanced UV resistance. For above ground installation, Yelomine products restrain the joints - the proposed installation should be analyzed for additional restraint requirements.

INSTALLATION METHODS

- Above Ground
- Temporary Bypass
- Static Pipe-bursting
- Horizontal Directional Drilling
- Open-cut



Applications	Potable Water	Wastewater	ReclaimedWater
Pipe Color:	Yellow	Green	Purple
Coupling Color:	Yellow	Yellow	Yellow
Certifications:*	NSF 61, NSF 14*	None	None

Only products bearing the NSF Mark are Certified

** SDR 26, SDR 21, SDR 17 pipe with PVC couplings rated up to 250 psi rated only.*

www.westlakepipe.com

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Construction Methods for Utility Installations

Construction methods shall conform to the "Accommodations Manual" Section 530.500 and 530.510 and appropriate sections for specific utility type except that:

"Boring and Jacking" shall be replaced with "Boring and Jacking or Horizontal Directional Drilling".

For the purpose of these provisions for the term "Bore" applies to all approved trenchless technologies

Pneumatic drilling and hammer drilling are not allowed.

There shall be no tunneling whatsoever under and across the shoulders and pavement.

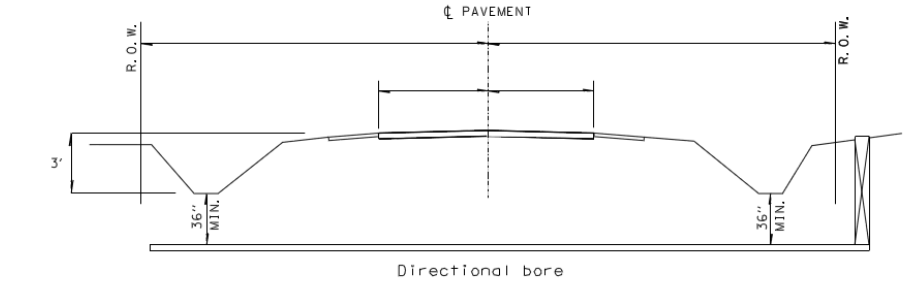
No boring will be allowed within ten feet (10') of the ends or under pipe culverts, field entrances or drainage structures along the highway right-of-way.

Encasement shall be furnished between bore pits unless continuous pipe or Department approved jointed pipe is used under the roadway structure (see "Accommodations Manual" Section 530.30, "Department Approved").

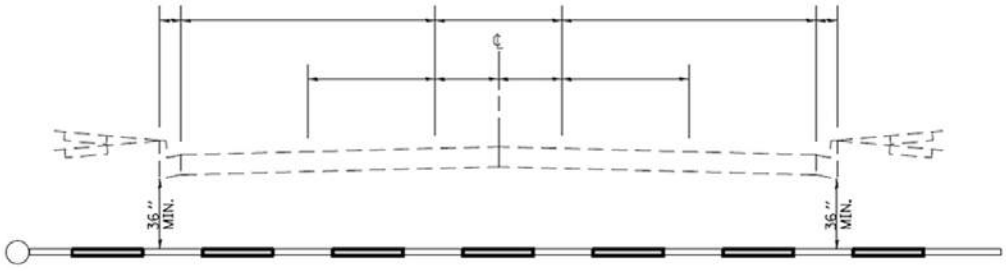
No pits will be allowed in the foreslope or the bottom of the ditch.

Fiber optic cable conduit installed near bridge structures shall be a minimum of seventy five feet (75') behind the bridge abutment location.

A record of directional bores depths, taken at ten foot (10') intervals across the pavements, shall be submitted immediately after the completion of the installation.



Directional bore



JACK AND BORE OR DIRECTIONAL BORE

Applicable provisions of the "All Utility Work" section shall also apply to this section.

Patching Details

If a patch is necessary, all exterior and interior edges shall be made with saw cuts.

The pavement shall be scored no more than one day prior to the start of work except when pavement is closed to traffic. Materials resulting from the removal of the existing pavement shall be disposed of according to *Standard Specifications for Roads and Bridge Construction* Article 202.03

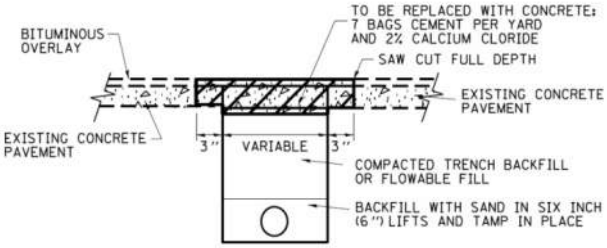
Applicable provisions of the "All Utility Work" section shall also apply to this section.

Finished Open Cut Patch Detail and Hot Mix Asphalt Patch Detail

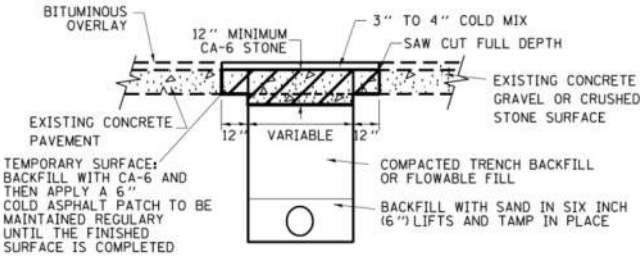
The sub base shall be moistened just prior to concrete placement. If rain is imminent, concrete shall not be poured, and unhardened concrete shall be covered immediately. The surface shall be textured according to Article 420.09 of the current *Standard Specifications for Road and Bridge Construction*.

When concrete is placed after October 15th and before April 15th, a protective coat shall be applied to the surface according to Article 420.18 of the current *Standard Specifications for Road and Bridge Construction*. Concrete may be placed when the air temperature is above 40 degrees and rising and falling temperature reaches 45 degrees. High-Early Strength concrete shall be used after 11:30 am when repairing patches; unless the patch will be opened prior to the contractors leaving for the work the day the patched is being repaired to avoid an overnight lane closure.

Finished Open Cut Patch Detail

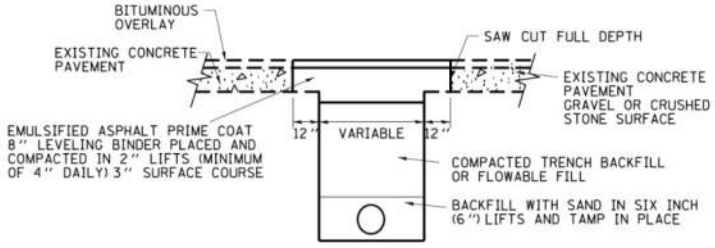


Temporary Hot Mix Asphalt Patch Detail



Hot Mix Asphalt Patch Detail

HMA shall be placed on a clean, dry base and when weather conditions are suitable. The leveling binder and binder courses shall be placed only when the temperature in the shade is at least 40° F (5° C) and the forecast is for rising temperatures. The surface course shall be placed only when the air temperature in the shade is at least 45° F (8° C) and the forecast is for rising temperatures.



Applicable provisions of the "All Utility Work" section shall also apply to this section.

All Utility Work:
All facilities including anchors, guys, fixtures, and appurtenances, shall be located and constructed in accordance with the description, special provisions and the Permittee shall thereafter operate and maintain said facilities, all to the satisfaction of the Region Engineer or his duly authorized representative, and all work and material shall conform to the *Standard Specifications for Road and Bridge Construction*.

Construction Methods:
Construction methods shall be according to "Accommodations Manual" Section 530.500 and appropriate sections for the specific utility including the following addition or revisions:

Construction repair materials shall be placed according to "Accommodations Manual" Section 530.500 (f). If construction materials occupy the right-of-way without additional approval for longer than six months, the Department may remove the materials at the expense of the Permittee.

The Permittee shall keep the highway pavement clear of mud, gravel, sand, or any other construction debris at all times.

All saw cuts will be full depth.

Where practical, excavation material shall be deposited between the roadway and the excavated area as added protection until removal from the row.

For no reason shall open holes be left open overnight.

Horizontal Directional drilling may be substituted for Jack and Bore with specific approval from the Department.

Encasement shall be furnished in accordance with "Accommodations Manual" Section 530.510 and appropriate sections for specific utility type except that encasement shall extend between bore pits unless continuous pipe or Department approved jointed pipe is used under the roadway structure

Vegetation Control:
Tree trimming/removal vegetation control shall be according to "Accommodations Manual" Sections 530.600 and 500.610 with the following additions:

Tree trimming/removal must be identified and noted on the permit plan sheet and kept to a minimum. A review by Department personnel shall be done prior to any cutting or spraying operation. The Department reserves the right to deny specific trimming/removal/spraying request

Fines may be accessed by other agencies for improper vegetation control.

In protected areas such as, restoration area seedlings, roadside prairie or other areas designated by signage, at no time shall vehicles, construction equipment, or construction material are to be in these designated areas. The method of utility installation in the protected areas will be completed by solely directional boring.

Locations:
All utility installations shall conform to "Accommodations Manual" Section 530.230 and appropriate sections for the specific utility including the following addition or revisions:

Longitudinal lines shall be located as near the right-of-way line as practicable. The preferable distance will be the distance requested by the applicant but no more than eight feet (8') from and parallel to the right-of-way line.

Any utility more than eight feet (8') away from the ROW needs to be a minimum of eight feet (8') deep and have prior approval from the Permits Unit for a variance.

Areas within municipal boundaries are to be within the eight feet (8') from the right-of-way by law but no closer to the pavement than five feet (5').

All utilities that cross under the state right-of-way shall be placed at a 90-degree angle to the centerline of the pavement.

No utilities are allowed in the shoulder, foreslope, bottom of the ditch, under culverts, or within ten feet (10') of culvert end sections.

All appurtenances (hand holes, valves, markers, pedestals, etc.) must be within one (1') of the right-of-way line. Any appurtenances not within one (1') require range poles for protection during maintenance operations.

All ground mounted appurtenances shall be provided with a well maintained vegetation-free area extending one (1') beyond the appurtenance in all directions.

Any utility located within the drip line of any tree designated by the Department to be spared shall be bored under the root system.

No pole will be allowed in the clear zone of any State highway.

The Permittee shall stay a minimum of two feet (2') (0.61m) away from all sign poles (wooden or steel) and shall not place the facility between or under sign structures. The sign structures shall not to be removed and replaced without the approval of this office.

A minimum bury depth of thirty-six (36") is required for all underground utilities unless crossing a waterway where the minimum bury depth will be fifty four inches (54") below the flow line grade of the waterway.

Restoration:

The right-of-way shall be restored in accordance with "Accommodations Manual" Section 530.250 except that restoration shall also include the following provisions:

Any drainage mat or pipe under drains damaged during utility installation operations shall be repaired or replaced.

Pavement cuts allowed by "Accommodations Manual" Section 530.500(e) shall be removed and replaced with a permanent patch within six months

The right-of-way shall be returned to a condition which is at least as good as it was before the permitted work took place, in a timely manner. This includes restoration of entrances and side roads. Restoration of roadway surfaces will be made using Department approved materials and methods (see "Accommodations Manual" Section 530.30 "Department Approved").

If sidewalks are damaged by the permitted or permitted contractors, the repair shall conform to the current ADA standards to the greatest extent practicable. Proposed construction of sidewalks or repairs shall conform to the current section 424 of the *Standard Specifications for Road and Bridge Construction*.

The Permittee will shape, fertilize, seed and straw all right-of-way damaged in the construction of this line. The following quantities shall be used:

Fertilizer:	10-6-4 800 lbs. per acre.
Seed:	50 lbs. Blue Grass, 16 lbs. Peren, Rye, 8 lbs. Red Top and 2 lbs. White Dutch Clover per acre.
Straw:	2 tons per acre.

Drainage:

It is understood and agreed that the Applicant, his successors, or assigns shall not alter or change the existing natural drainage contours of this property to discharge additional storm water onto the state highway right-of-way. If a change is proposed in the grade, area, or type of surface, the Applicant, his successors, or assigns shall submit a plan to the Illinois Department of Transportation for review before making such changes.

Traffic Control:

For the health and safety of utility crews working on the right-of-way and the traveling public in work zones all necessary traffic control shall be used. (signs, barricades, flaggers, etc.),

Complete lists of Highway Traffic Control Standards are available on the Illinois Department of Transportation's website. For assistance with traffic control, call the Utility Permits office during office hours at (217) 342-8310.

When doing the work covered in this permit, the Permittee is responsible for providing and installing warning signs, protective devices and flaggers. The traffic control standards included in the permit are a minimum requirement and additional or supplemental devices may be required. Traffic Control may be amended by the Department. Message Boards may be required with the Traffic Control Standards listed to ensure public safety when traffic complexities and hazards arise.

The roadway shall remain open to traffic at all times while completing the work unless otherwise authorized by this permit.

It should be noted that standards and typical placement of devices are considered minimum. Many locations may require additional or supplemental devices.

Additional Type I barricades, Type II barricades, or vertical panels on 50-foot centers will be required along the edge of the open lane of traffic if the difference in elevation between the open lane and the area adjacent to it exceeds 2 inches.

No construction equipment shall be permitted to park on or use the travel lanes, ramps, shoulders, medians or crossovers of an access controlled highway for installing or servicing any facility.

Whenever any of the work under this permit involves any obstruction or hazard to the free flow of traffic in the normal traffic lanes, plans for the proposed method of traffic control must be submitted to and approved by the Region Engineer at least 72 hours and preferably longer, before the start of work.

In protected areas such as, restoration area seedlings, roadside prairie or other areas designated by signage, at no time shall vehicles, construction equipment, or construction material be in these designated areas. The method of utility installation in the protected areas will be completed by solely directional boring.

PERMIT PROVISIONS

District 7 includes the Counties of: Clark, Clay, Coles, Crawford, Cumberland, Edwards, Effingham, Fayette, Jasper, Lawrence, Macon, Moultrie, Richland, Shelby, Wabash and Wayne. All utility facilities installed on state highway right-of-way within District 7 shall conform to the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" except as amended by these provisions.

The Permittee is hereby granted permission to encroach on the Illinois state highway right-of-way as shown on the attached plans and provisions which are made a part of this permit. A copy of the issued Utility Permit must be on the job site during utility installation activities. It is the Permittee's responsibility to insure all persons working on their behalf have a signed copy of the permit; including but not limited to the application, specifications, plans and the traffic control.

*** For additional useful permit information go to the Utility Permits web page at:**
http://www.idot.illinois.gov/doing-business/permits/utility-permits/index

Contacts:

D7 Utility Permit Unit (Contact Five Days Prior to Start of Work)
(217) 342-8310 - Elly Osborne, Utility Permits Technician

Traffic Control
(217) 342-8285 - Any specific questions about traffic control issues or concerns

IDOT Underground Wiring (Required Contact Five Days Prior to Start of Work)
WARNING: IDOT is not a member of JULIE: As non-JULIE members, utility companies are **required** to call the numbers below 5 working days prior to beginning work to receive locates of Department facilities.

(217) 342-5677 or (217) 342-8291 - Department owned wiring locates - fiber, highway lighting, traffic signals and illuminated sign structures

(217) 342-8276 - Department owned wiring locates at Rest Areas - highway lighting, and illuminated sign structures

If you have any questions, please contact the Utility Permit Office, Ms. Elly Osborne by phone at 217-342-8310 or by e-mail at Dot.D7.Permits@illinois.gov.

Utility Coordination for IDOT Construction projects
(217) 342-8315 Right-of-way question regarding utility relocations for public projects

Vegetation Permit Requests - Tree Removal
(217) 342-8276 Rest areas, tree removal, tree trimming or landscape issues

Environmental Studies (Special or Hazardous Waste)
(217) 342-3249 Environmental issues

IDOT Entrance Permit Section
(217) 342-8289/(217) 342-8283

Electronic Signature and Modification of Utility Permits

Using electronic submittals and/or signature is optional for the Permittee. **Please note that attachments or changes may have been added to this document after Permittee signature. Initiation of the actual work constitutes acceptance of the contents in the final executed permit.**

Legal Obligations, Release and Indemnification

The Permittee shall release and indemnify the State in accordance with the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" Section 530.225. In addition, the Permittee shall release, indemnify and hold harmless the State for any accidental breakage or damage to this facility caused by any construction, maintenance work or operations of the Department. The Permittee shall indemnify, defend and hold the State harmless for conflicts regarding right-of-way lines, including resolution of dedicated right-of-way requirements. The right-of-way dimensions shown on this permit, if any, are taken from Department plans. However, it is the Permittee's responsibility to establish the correct property and right-of-way lines. IDOT is not liable for the research, engineering, staking, and the layout of proposed permit locations. IDOT does not verify the accuracy of the dimensions provided on utility plan sheets included in permit applications. It is the responsibility of the utility company to perform installations in accordance with the ACCOMMODATION OF UTILITIES ON RIGHT-OF-WAY and the District 7 Special Provisions. No exceptions will be provided unless a variance is requested, and written approval is provided prior to utility installation.

Noncompliance and Changes to the Permit

Any changes to this permit shall require prior written approval. At any time, if the utility is installed in a manner not meeting Department policy, utility crews may be required to stop work immediately and remove said utilities. If the permitted facility is not placed as shown in the application, the Permittee shall submit a set of as-built plans and follow remediation steps in accordance with "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" Section 530.300.

Important Dates to Remember - Notice of Work Stoppage

Per the Standard Specifications for Roads and Bridge Construction Article 107.09, utility construction or maintenance operations on State highway right-of-way shall be discontinued during periods of inclement weather (such as snowy conditions, maintenance snow removal operations, heavy rain) or hours of darkness or when soil conditions are such that the utility work would result in extensive damage to the highway right-of-way. These restrictions will be waived when emergency work is required to restore vital utility services after contacting this office.

Work Prohibited During Legal Holidays

For the safety of the traveling public, work will not occur during any holiday period unless specifically approved by the utility permit office. These holidays shall include:

New Year's Easter Memorial Day Independence Day Labor Day Thanksgiving Day Christmas Day

The length of the Holiday period shall vary as follows depending on the day of the week the legal holiday falls on or is observed. No other notice will be given for required work stoppage for the holiday periods.

Day of the Holiday	Length of the Holiday Period
Sunday	3 PM Friday – 12 midnight Sunday
Monday	3 PM Friday – 12 midnight Monday
Tuesday	3 PM Friday – 12 midnight Tuesday
Wednesday	3 PM Tuesday – 12 midnight Wednesday
Thursday	3 PM Wednesday – 12 midnight Sunday
Friday	3 PM Thursday – 12 midnight Sunday
Saturday	3 PM Friday – 12 midnight Sunday

Traffic Control

For the health and safety of utility crews working on the right-of-way and the traveling public in work zones, all necessary traffic control shall be used. (Signs, barricades, flaggers, etc.).

Complete lists of Highway Traffic Control Standards are available on the Illinois Department of Transportation's website. For assistance with traffic control, call the Utility Permits office during office hours at (217) 342-8310.

When doing the work covered in this permit, the Permittee is responsible for providing and installing warning signs, protective devices and flaggers. The traffic control standards included in the permit are a minimum requirement and additional or supplemental devices may be required. Traffic Control may be amended by the Department. Message Boards may be required with the Traffic Control Standards listed to ensure public safety when traffic complexities and hazards arise.

The roadway shall remain open to traffic at all times while completing the work unless otherwise authorized by this permit.

Additional Type I barricades, Type II barricades, or vertical panels on 50-foot centers will be required along the edge of the open lane of traffic if the difference in elevation between the open lane and the area adjacent to it exceeds 2 inches.

No construction equipment shall be permitted to park on or use the travel lanes, ramps, shoulders, medians, or crossovers of an access-controlled highway for installing or servicing any facility.

Whenever any of the work under this permit involves any obstruction or hazard to the free flow of traffic in the normal traffic lanes, plans for the proposed method of traffic control must be submitted to and approved by the Region Engineer at least three (3) business days prior to the start of work.

Utility Locations

All utility installations shall conform to "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" Section 530.230 and appropriate sections for the specific utility including the following addition or revisions:

- GPS points will be accepted as an approximation of location. However, they do not give variance to the permit provisions. Right-of-way, dimensions, and GPS are not reviewed for accuracy.
- Longitudinal lines shall be located as near the right-of-way line as practicable. The preferable distance will be the distance requested by the applicant but no more than eight feet (8') from and parallel to the right-of-way line.

- Areas within municipal boundaries are to be within eight feet (8') of the right-of-way but no closer to the pavement than five feet (5').
- All utilities that cross under the State right-of-way shall be placed at a 90-degree angle to the centerline of the pavement.
- Utilities installed near bridge structures shall be a minimum of seventy-five feet (75') beyond the bridge abutment location.
- No utilities are allowed in the shoulder, foreslope, bottom of the ditch, under culverts, or within ten feet (10') of culvert end sections.
- All appurtenances (hand holes, valves, markers, pedestals, poles etc.) must be within one (1') of the right-of-way line and be clearly labeled. All ground mounted appurtenances shall be provided with a well-maintained vegetation-free area extending one (1') beyond the appurtenance in all directions.
- Any utility located within the drip line of any tree designated by the Department to be spared shall be bored under the root system.
- No pole will be allowed in the clear zone of any State highway.

The Permittee shall stay a minimum of two feet (2') away from all sign poles (wooden or steel) and shall not place the facility between or under sign structures. The sign structures shall not to be removed and replaced without the approval of this office.

A minimum bury depth of thirty-six (36") is required for all underground utilities unless crossing a waterway where the minimum bury depth will be fifty-four inches (54") below the flow line elevation of the waterway.

It is the responsibility of the utility company to perform installations in accordance with the ACCOMMODATION OF UTILITIES ON RIGHT-OF-WAY and the District 7 Special Provisions. No exceptions will be provided unless a variance is requested, and written approval is provided prior to utility installation.

Construction Methods for Utility Installation

Construction methods shall conform to Sections 530.500 and 530.510 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" and applicable sections for each specific utility type with the following additions or revisions:

- Construction repair materials shall be placed according to Section 530.500 (f) of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System". If construction materials occupy the right-of-way without additional approval for longer than six months, the Department may remove the materials at the expense of the Permittee.
- The Permittee shall keep the highway pavement clear of mud, gravel, sand, or any other construction debris at all times.
- All saw cuts will be full depth.
- Where practical, excavation material shall be deposited between the roadway and the excavated area as added protection until removal from the right-of-way.
- For no reason shall holes be left open overnight.
- Use of steel plates on the roadway pavements are not permitted.
- A combination of aboveground and belowground markers is used to identify and locate underground facilities. The facility is color-coded in accordance with the American Public Works Association (APWA) guidelines to assist in identifying an aboveground or belowground facility. The purpose of aboveground markers is to identify underground facilities, not to locate for excavation or circumvent the one call process. The owner shall maintain the markers in good condition, must be permanent and weatherproof/UV resistant.

  All existing buried utilities, including pipelines delivering natural gas or other gaseous products, water, salt, sewage, steam, buried electric lines, telephone, fiber optic, broadband, other communication systems, petroleum products, and any other buried facilities with above ground appurtenances thereto located within the rights-of-way of highways under the jurisdiction of the Department shall have such above ground appurtenances clearly marked with the appropriate warning.

  In the case of two or more utilities jointly owning or using a pole or pole line structure, each of the utilities shall mark each pole or structure with the initials of its name, abbreviation of its name, corporate symbol, or other distinguishing mark so that the ownership of such structure may be readily and determined. A utility shall mark each wood pole, post, tower, or other structure used for the support or attachment of electrical conductors, guys, or lamps, with dating nails or similar devices indicating the year in which the structure was installed. The requirements of this rule shall apply to all existing and future erected structures and to all changes in ownership.

Utility Installation within Fully Access-Controlled Right-of-Way

Construction methods for access-controlled highways shall conform to the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" under the specific utility that will be installed, except that the latest laws and standards shall be used. This is including but not limited to facilities along and crossing said highways, both above-ground and underground.

Access control fence may be opened to install specifically approved utilities but at no time is the fence to be left unrestricted. The restricted entry must be maintained at all times by placing a temporary barrier, taping or roping off the opened areas until the restoration of access control fence can be made. The repair to the fence will be made in kind and consist of replacement from post to post of the opened area to enable construction of the utility.

Longitudinal construction must stay as close as possible and no further than eight feet (8') from the right-of-way line.

Handholes along the interstate shall be buried a minimum of 12 inches and the markers placed at the right of way.

A depth of forty-eight inches (48") or greater for all underground utilities shall be maintained within access-controlled right-of-way unless crossing a waterway where the minimum allowed depth shall be sixty inches (60") below the flow line elevation of the waterway.

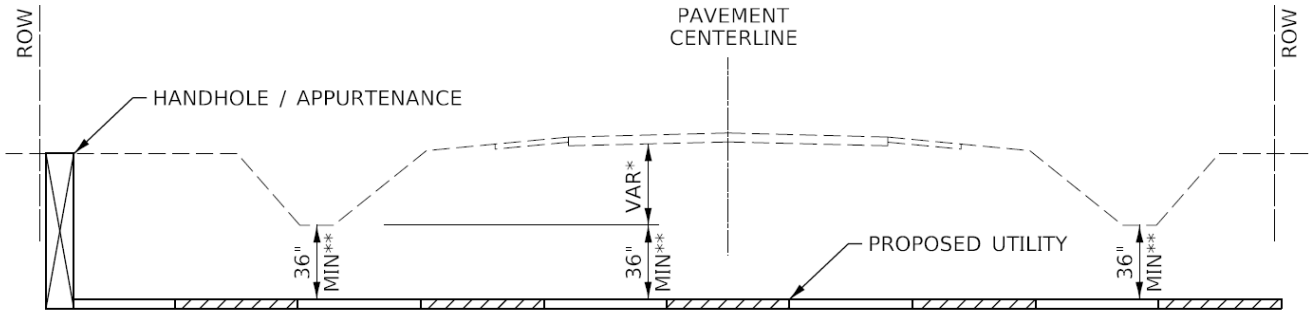
No utility or appurtenances (e.g., pumping stations, transformers, handholes, pedestals, markers) will be allowed within interchange areas of the right-of-way.

Utilities installed near bridge structures shall be a minimum of seventy-five feet (75') beyond the bridge abutment location.

Typical Cross Sections

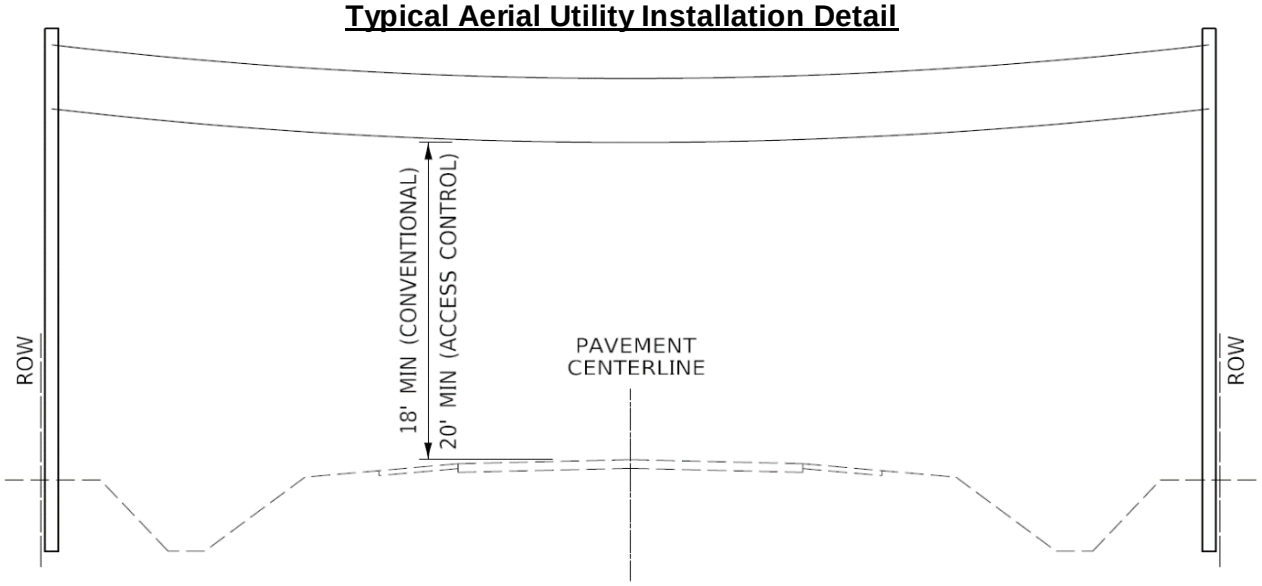
Utility installations shall conform to the cross sections provided below. Deviation from these typical sections shall require review and prior written approval from the Department.

Typical Underground Utility Installation Detail



*A 36" MINIMUM BURY DEPTH IS REQUIRED IN LOCATIONS WHERE NO ROADSIDE DITCHES ARE PRESENT
**A 48" MINIMUM BURY DEPTH IS REQUIRED WHEN CROSSING ACCESS-CONTROLLED RIGHT-OF-WAY

Typical Aerial Utility Installation Detail



Miscellaneous Utility Items

All facilities (including anchors, guys, fixtures, and appurtenances) shall be located and constructed in accordance with the description, details and provisions included in the approved utility permit as well as the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System". The Permittee shall thereafter operate and maintain said facilities, all to the satisfaction of the Regional Engineer or his duly authorized representative, and all work and material shall conform the "Standard Specifications for Road and Bridge Construction in Illinois".

Petroleum Products Pipelines

Petroleum products pipelines shall be constructed, maintained, and operated in accordance with Section 530.420 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System".

Power and Communication Lines

Above ground power and communication facilities shall conform to Section 530.450 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" and appropriate sections for the specific utility type except that:

- Underground facilities shall conform to Section 530.400 and appropriate sections for specific utility type.
- Underground power cables must be grounded in accordance with the National Electrical Safety Code.

Power

All power lines installed on state highway right-of-way shall conform to Section 530.450 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" for underground and Section 530.450 for above ground facilities.

Cable

All cable lines shall be constructed, maintained, and operated in accordance with Section 530.400 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System".

Gas

Gas pipelines installed on State highway right-of-way shall conform to Section 530.410 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" except that the latest laws and standards shall be used.

Water Lines

Water lines installed on State highway right-of-way shall conform to Section 530.430 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" except that the latest laws and standards shall be used.

Any water lines six inches and larger must be encased under the highway. After the pipe laying is completed, the Permittee shall completely backfill the trench in three equal lifts, each lift being mechanically tamped.

Sewer Lines and Drainage Lines

Sewer and Drainage lines installed on State highway right-of-way shall conform to Section 530.440 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" except that the latest laws and standards shall be used.

Highway Lighting

Highway lighting installed on State highway right-of-way shall conform to Section 530.460 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" except that:

- All current laws and standards shall be used.
- The Permittee is responsible for 100% of all energy costs, work and maintenance of any or all facilities related to these installations unless stipulated in other written agreements.
- Highway lighting shall be pre-approved by the Department's Central Office prior to start of work.

Trenchless Utility Installation

Trenchless utility installation shall conform to Sections 530.500 and 530.510 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" and applicable sections for each specific utility type except that:

- "Boring and Jacking" shall be replaced with "Boring and Jacking or Horizontal Directional Drilling". Horizontal Directional drilling may be substituted for Jack and Bore with specific approval from the Department.
- For the purpose of these provisions, the term "Bore" applies to all approved trenchless technologies.
- Pneumatic drilling and hammer drilling are not allowed.
- There shall be no tunneling whatsoever under and across the shoulders and pavement.
- Encasement shall be furnished between bore pits unless continuous pipe or Department approved jointed pipe is used under the roadway structure (refer to Section 530.30 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System", "Department Approved").
- No pits will be allowed in the shoulder, foreslope or the bottom of the ditch.

Pavement Restoration

Patching Details

If a patch is necessary, all exterior and interior edges shall be made with saw cuts.

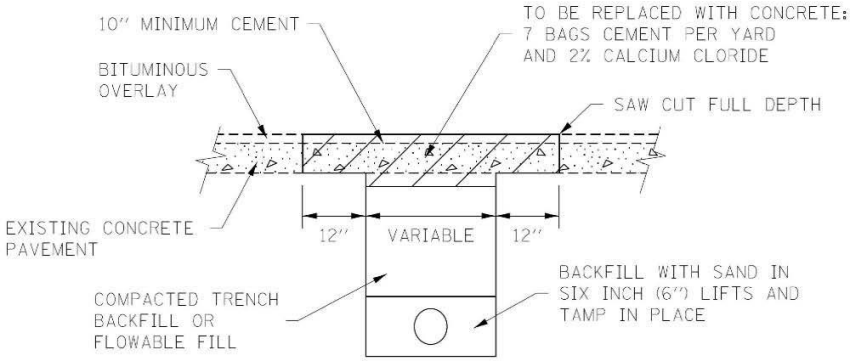
The pavement shall be scored no more than one day prior to the start of work except when pavement is closed to traffic. Materials resulting from the removal of the existing pavement shall be disposed of according to Article 202.03 of the "Standard Specifications for Roads and Bridge Construction in Illinois".

Finished Open Cut Patch Detail and Hot Mix Asphalt Patch Detail

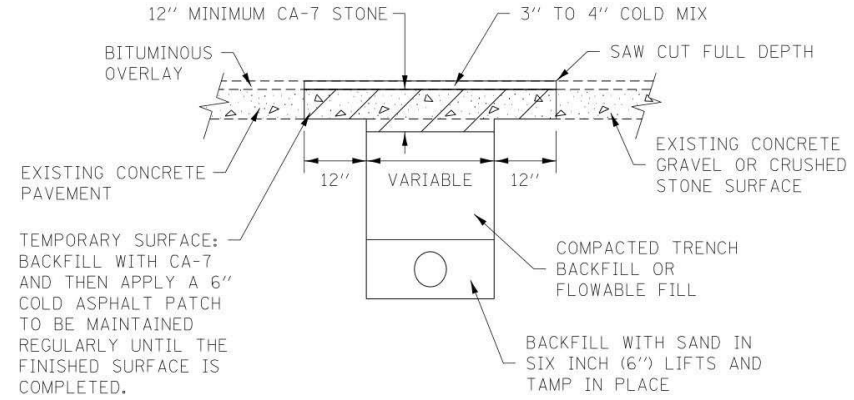
The subbase shall be moistened just prior to concrete placement. If rain is imminent, concrete shall not be poured, and unhardened concrete shall be covered immediately. The surface shall be textured according to Article 420.09 of the current "Standard Specifications for Road and Bridge Construction in Illinois".

When concrete is placed after October 15th and before April 15th, a protective coat shall be applied to the surface according to Article 420.18 of the current "Standard Specifications for Road and Bridge Construction in Illinois". Concrete may be placed when the air temperature is above 40 degrees and rising and falling temperature reaches 45 degrees. High-Early Strength concrete shall be used after 11:30 AM when repairing patches; the patch shall be opened prior to the contractor leaving the work to avoid an overnight lane closure.

Finished Open Cut Patch Detail (Concrete)

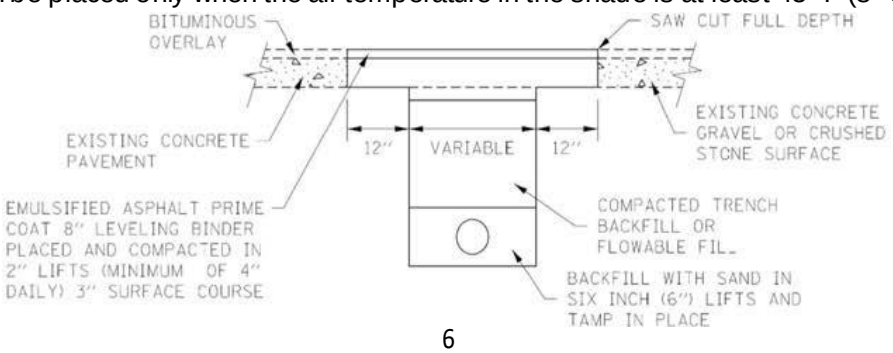


Temporary Hot-Mix Asphalt Patch Detail



Finished Open Cut Patch Detail (Hot-Mix Asphalt)

HMA shall be placed on a clean, dry base and when weather conditions are suitable. The leveling binder and binder courses shall be placed only when the temperature in the shade is at least 40° F (5° C) and the forecast is for rising temperatures. The surface course shall be placed only when the air temperature in the shade is at least 45° F (8° C) and the forecast is for rising temperatures.



Right-of-Way Restoration

The right-of-way shall be restored in accordance with Section 530.250 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" except that restoration shall also include the following provisions:

- Any drainage mat or pipe under drains damaged during utility installation operations shall be repaired or replaced.
- Pavement cuts allowed by Section 530.500(e) of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" shall be removed and replaced with a permanent patch within six months.
- The right-of-way shall be returned, in a timely manner, to a condition which is at least as good as it was before the permitted work took place. This includes restoration of entrances and side roads. Restoration of roadway surfaces will be made using Department approved materials and methods (refer to Section 530.30 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System", "Department Approved").
- If sidewalks are damaged by the permittee or permittee's contractors, the repair shall conform to the current ADA standards to the maximum extent practicable. Proposed construction of sidewalks or repairs shall conform to the current Section 424 of the "Standard Specifications for Road and Bridge Construction in Illinois".
- The Permittee will shape, fertilize, seed and straw all right-of-way damaged in the construction of utilities. The following quantities shall be used:
  Fertilizer: 10-6-4 800 lbs. per acre.
  Seed: 50 lbs. Blue Grass, 16 lbs. Perennial Rye, 8 lbs. Red Top and 2 lbs. White Dutch Clover per acre.
  Straw: 2 tons per acre.

Handholes

Handholes, vaults and junction boxes must be installed flush with the surrounding ground elevation and constructed of polymer concrete or quazite. All structures must be heavy-duty with a minimum load rating of tier 15, tier 22 or 20,000 lbs. All handhole covers need to be appropriately labeled on the installed handholes and marked on the plans.

Vegetation Control

Tree trimming/removal and vegetation control shall be in accordance with Sections 530.600 and 500.610 of the "Accommodation of Utilities on Right-of-Way of the Illinois State Highway System" with the following additions:

- Tree trimming/removal must be identified and noted on the permit plan sheet and kept to a minimum. A review by Department personnel shall be done prior to any cutting or spraying operation. The Department reserves the right to deny specific trimming/removal/spraying requests.
- Fines may be accessed by other agencies for improper vegetation control.
- At no time shall vehicles, construction equipment, or construction material be permitted in protected areas such as restoration area seedlings, roadside prairie, or other areas designated by signage. The method of utility installation in the protected areas will be completed solely by directional boring.

NPDES

The NPDES Permit program imposes erosion and sediment control requirements on construction projects that involve disturbance of 0.4 hectares (1acre) or more of total land area. All NPDES requirements must be followed on Utility Permits. If this project has no clearing or grubbing, excavation, stockpiling of topsoil, borrow, or construction of embankment, these type of projects will normally be exempt from erosion and sediment control measures.

Drainage

It is understood and agreed that the Permittee, their successors, or assigns shall not alter or change the existing natural drainage contours to discharge additional storm water onto the State highway right-of-way. If a change is proposed in the grade, area, or type of surface, the Permittee, his successors, or assigns shall submit a plan to the Illinois Department of Transportation for review and written approval before making such changes.

Utility Emergency and Maintenance Repairs

A permit is required when maintenance or an emergency is to be performed on utility facilities. The utility owner shall notify the Department immediately when emergency repairs are needed. Emergency repairs are those that correct a condition which is life-threatening or causing immediate peril. These emergency repairs may be conducted immediately but must be followed up by written notification in the form of a completed utility permit application as per District 7. Permittee shall comply with all emergency repair procedures in Section 530.290(c)(1)(2)(3)(4). Maintenance work is that which is performed to restore the integrity of the utility to the original condition and a permit should be requested following the standard utility permitting procedure before beginning this work. Work which changes the facility by upgrading, downgrading, or removing the facility will not to be considered maintenance.

The Permittee shall assume all responsibility for interference with existing utilities in, along, or upon said highway.

January 1, 2025

Illinois Department of Transportation

Standards by Division

DIVISION 700 WORK ZONE TRAFFIC CONTROL AND PROTECTION, SIGNING, AND PAVEMENT MARKING

STD. NO.	TITLE
WORK ZONE TRAFFIC CONTROL AND PROTECTION	
701001-02	Off-Road Operations, 2L, 2W, More Than 15’ (4.5 m) Away
701006-05	Off-Road Operations, 2L, 2W, 15’ (4.5 m) to 24” (600 mm) From Pavement Edge
701011-04	Off-Road Moving Operations, 2L, 2W, Day Only
701101-05	Off-Road Operations, Multilane, 15’ (4.5 m) to 24” (600 mm) From Pavement Edge
701106-02	Off-Road Operations, Multilane, More Than 15’ (4.5 m) Away
701201-05	Lane Closure, 2L, 2W, Day Only, for Speeds $\geq$ 45 MPH
701206-05	Lane Closure, 2L, 2W, Night Only, for Speeds $\geq$ 45 MPH
701301-04	Lane Closure, 2L, 2W, Short Time Operations
701306-04	Lane Closure, 2L, 2W, Slow Moving Operations Day Only, for Speeds $\geq$ 45 MPH
701311-03	Lane Closure, 2L, 2W, Moving Operations - Day Only
701316-14	Lane Closure, 2L, 2W, Bridge Repair
701321-19	Lane Closure, 2L, 2W, Bridge Repair with Barrier
701326-04	Lane Closure, 2L, 2W, Pavement Widening, for Speeds $\geq$ 45 MPH
701331-05	Lane Closure, 2L, 2W, With Run-Around, for Speeds $\geq$ 45 MPH
701336-07	Lane Closure, 2L, 2W, Work Areas in Series, for Speeds $\geq$ 45 MPH
701400-12	Approach to Lane Closure, Freeway/Expressway
701401-13	Lane Closure, Freeway/Expressway
701402-12	Lane Closure, Freeway/Expressway, with Barrier
701406-13	Lane Closure, Freeway/Expressway, Day Operations Only
701411-09	Lane Closure, Multilane, at Entrance or Exit Ramp, for Speeds $\geq$ 45 MPH
701416-11	Lane Closure, Freeway/Expressway, with Crossover and Barrier
701421-08	Lane Closure, Multilane, Day Operations Only, for Speeds $\geq$ 45 MPH to 55 MPH
701422-10	Lane Closure, Multilane, for Speeds $\geq$ 45 MPH to 55 MPH
701423-10	Lane Closure, Multilane, with Barrier, for Speeds $\geq$ 45 MPH to 55 MPH
701426-09	Lane Closure, Multilane, Intermittent or Moving Operation, for Speeds $\geq$ 45 MPH
701427-05	Lane Closure, Multilane, Intermittent or Moving Operation, for Speeds $\leq$ 40 MPH
701428-01	Traffic Control, Setup and Removal, Freeway/Expressway
701431-13	Lane Closure, Multilane, Undivided with Crossover, for Speeds $\geq$ 45 MPH to 55 MPH
701446-11	Two Lane Closure, Freeway/Expressway
701451-05	Ramp Closure Freeway/Expressway
701456-05	Partial Exit Ramp Closure Freeway/Expressway
701501-06	Urban Lane Closure, 2L, 2W, Undivided
701502-09	Urban Lane Closure, 2L, 2W, with Bidirectional Left Turn Lane
701601-09	Urban Lane Closure, Multilane, 1W or 2W with Nontraversable Median
701602-10	Urban Lane Closure, Multilane, 2W with Bidirectional Left Turn Lane
701606-10	Urban Single Lane Closure, Multilane, 2W with Mountable Median
701611-01	Urban Half Road Closure, Multilane, 2W with Mountable Median
701701-10	Urban Lane Closure, Multilane Intersection

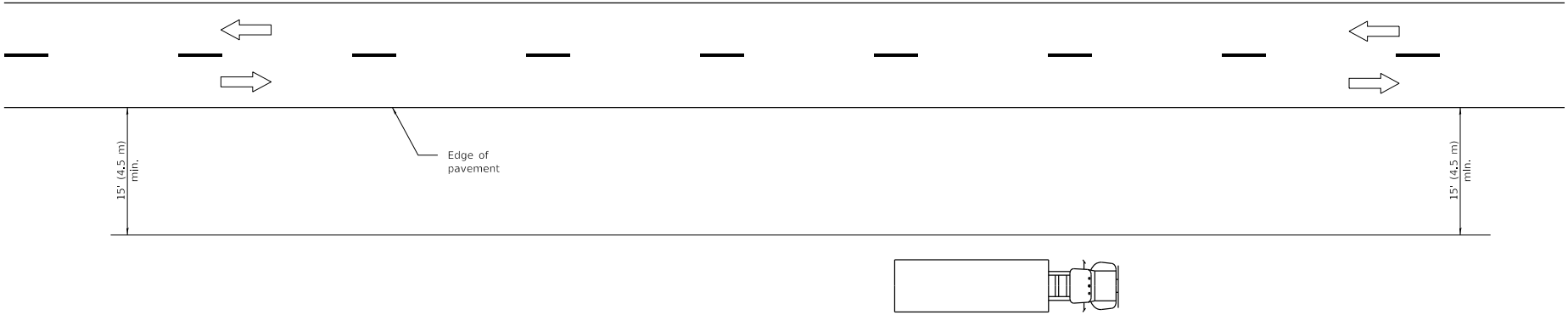
701801-06 Sidewalk, Corner or Crosswalk Closure
701901-10 Traffic Control Devices
704001-08 Temporary Concrete Barrier

SIGNING

720001-01 Sign Panel Mounting Details
720006-04 Sign Panel Erection Details
720011-01 Metal Posts for Signs, Markers and Delineators
720016-04 Mast Arm Mounted Street Name Signs
720021-03 Sign Panels, Extruded Aluminum Type
725001-01 Object and Terminal Markers
728001-01 Telescoping Steel Sign Support
729001-01 Applications of Types A and B Metal Posts (For Signs & Markers)
731001-01 Base for Telescoping Steel Sign Support

PAVEMENT MARKING

780001-05 Typical Pavement Markings
781001-04 Typical Applications Raised Reflective Pavement Markers
782001-01 Curb Reflectors
782006-01 Guardrail and Barrier Wall Reflector Mounting Details



TYPICAL APPLICATIONS

Landscaping work

Utility work

Fencing contracts and maintenance

Cleaning culverts

GENERAL NOTES

This Standard is used where at all times all vehicles, equipment, workers or their activities are more than 15' (4.5 m) from the edge of pavement.

When the work operation requires that two or more work vehicles cross the 15' (4.5 m) clear zone in any one hour, traffic control shall be according to Standard 701006.

All dimensions are in inches (millimeters) unless otherwise shown.

Illinois Department of Transportation

PASSED January 1, 2009
ENGINEER OF OPERATIONS

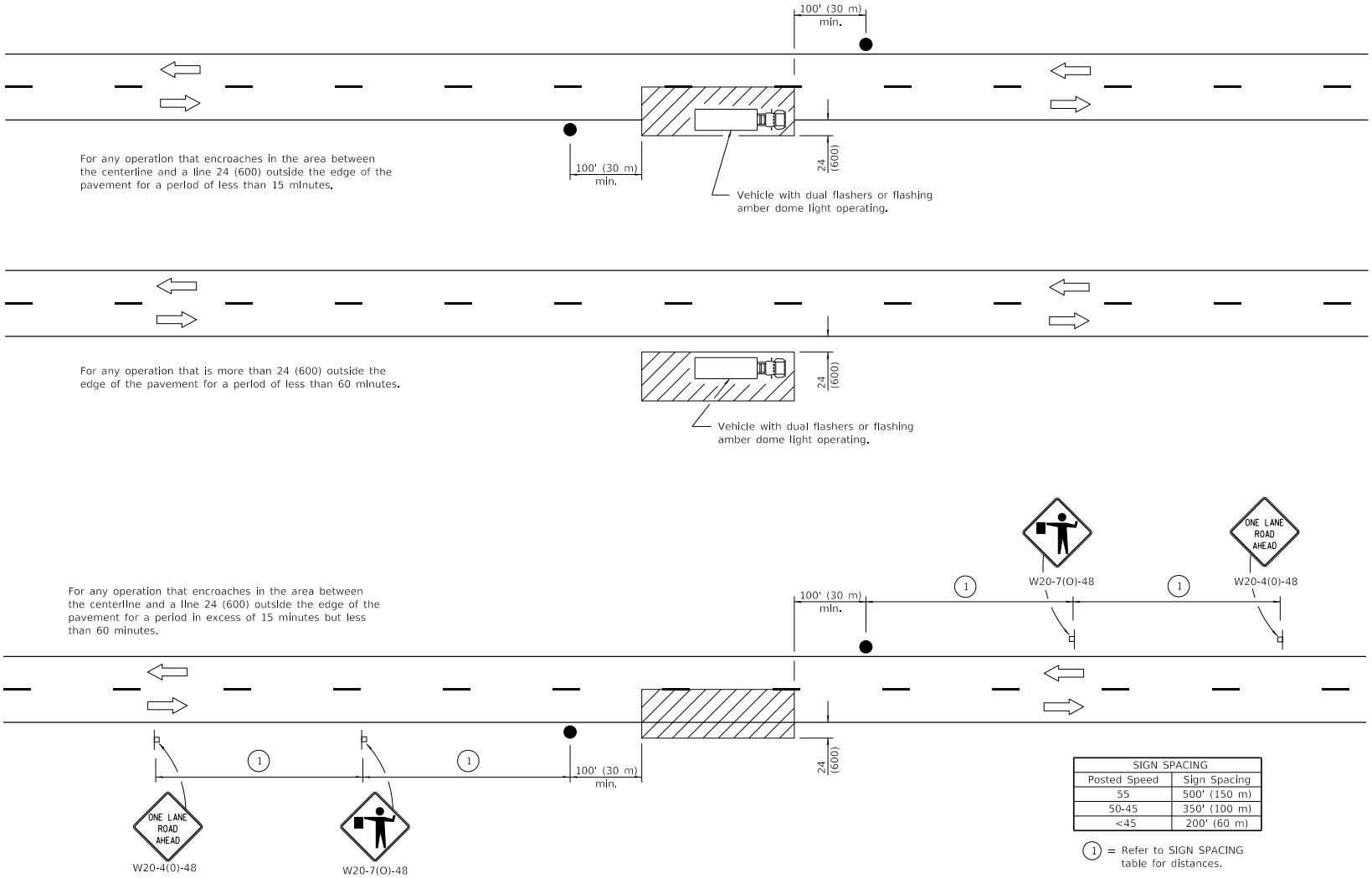
APPROVED January 1, 2009
ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-97

DATE	REVISIONS
1-1-09	Switched units to
	English (metric).
1-1-05	Revised title and notes.

OFF-RD OPERATIONS, 2L, 2W, MORE THAN 15' (4.5 m) AWAY

STANDARD 701001-02



SIGN SPACING	
Posted Speed	Sign Spacing
55	500' (150 m)
50-45	350' (100 m)
<45	200' (60 m)

(1) = Refer to SIGN SPACING table for distances.

TYPICAL APPLICATIONS

Marking patches
Field survey
String line
Utility operations
Cleaning up debris on pavement

SYMBOLS

Work area

Sign on portable or permanent support

Flagger with traffic control sign

All dimensions are in inches (millimeters) unless otherwise shown.

Illinois Department of Transportation

PASSED January 1, 2011
ENGINEER OF SAFETY ENGINEERING

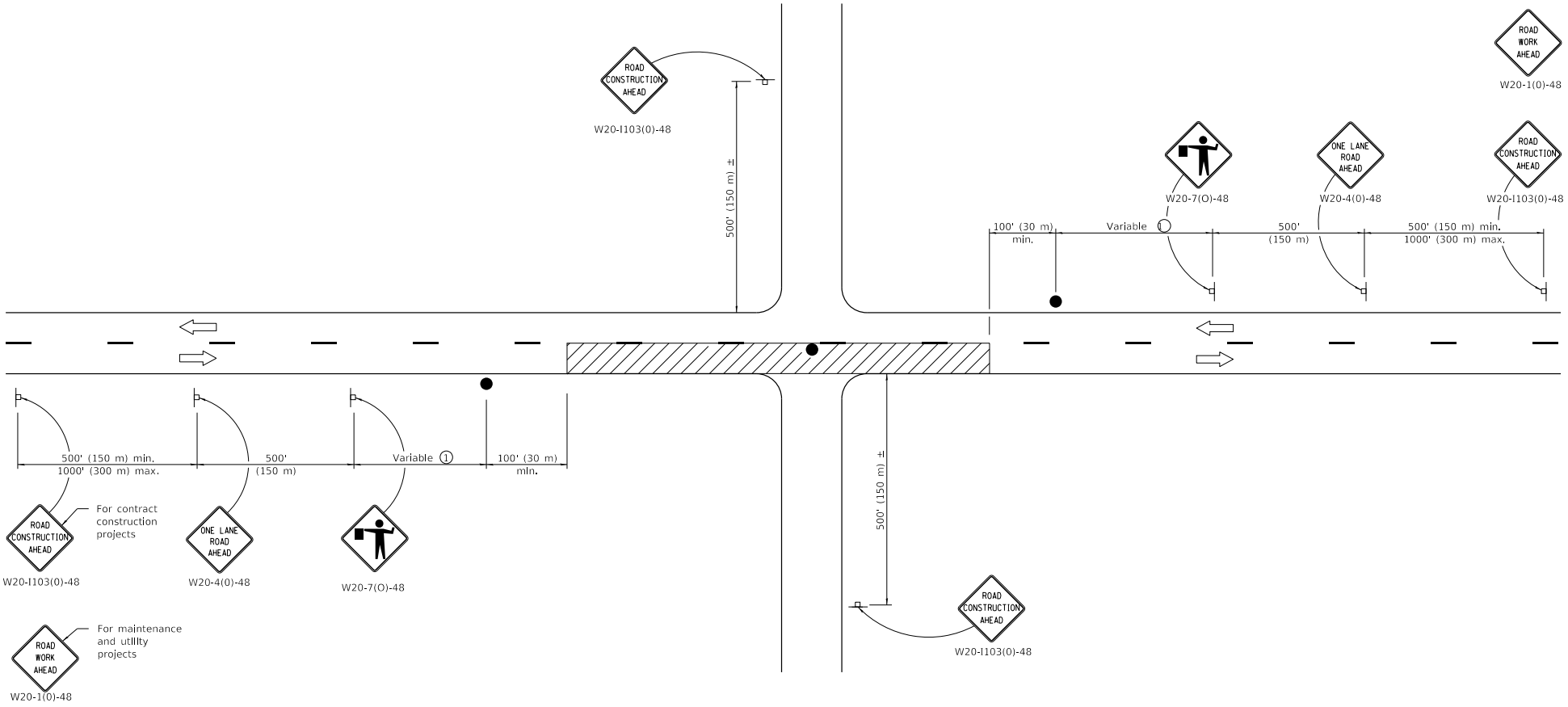
APPROVED January 1, 2011
ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-97

DATE	REVISIONS
1-1-11	Revised flagger sign.
1-1-09	Switched units to
	English (metric).

LANE CLOSURE, 2L, 2W, SHORT TIME OPERATIONS

STANDARD 701301-04



TYPICAL APPLICATIONS

Bituminous resurfacing
Milling operations
Utility operations
Shoulder operations

SYMBOLS

Work area

Sign on portable or permanent support

Flagger with traffic control sign

(1) Minimum distance is 200' (60 m). Maximum distance to be determined by the Engineer but should not exceed ½ the length required for one normal working day's operation or 2 miles (3200 m), whichever is less.

GENERAL NOTES

This Standard is used where at any time, any vehicle, equipment, workers or their activities require an intermittent or continuous moving operation on the pavement where the average speed of movement is greater than ½ mph (1 km/h) and less than 4 mph (6 km/h).

When the operation does not exceed 60 minutes, traffic control may be according to Standard 701301.

All dimensions are in inches (millimeters) unless otherwise shown.

Illinois Department of Transportation

PASSED January 1, 2018
ENGINEER OF SAFETY, PROG. AND ENGINEERING

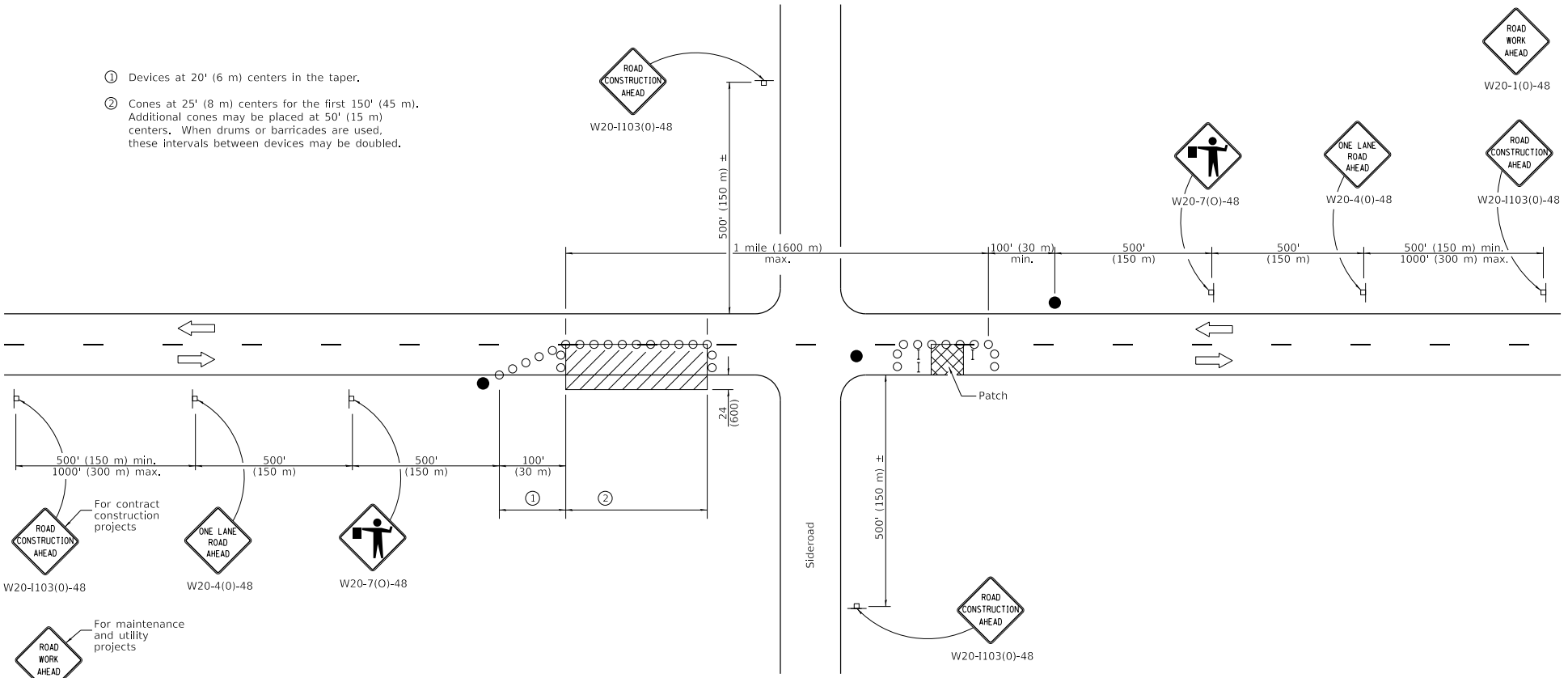
APPROVED January 1, 2018
ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-97

DATE	REVISIONS
1-1-18	Revised lower speed limit
	for operation to ½ mph.
1-1-11	Revised flagger sign.

LANE CLOSURE, 2L, 2W, SLOW MOVING OPERATIONS DAY ONLY, FOR SPEEDS ≥ 45 MPH

STANDARD 701306-04



TYPICAL APPLICATIONS

Isolated patching
Utility operations
Storm sewer
Culverts
Cable placement

SYMBOLS

- Work area
- Sign
- Barricade or drum
- Cone, drum or barricade
- Flagger with traffic control sign

GENERAL NOTES

This Standard is used where at any time, any vehicles, equipment, workers or their activities will encroach in the area between the center line and a line 24 (600) outside the edge of pavement for daylight operation.

When the distance between successive work areas exceeds 2000' (600 m), additional warning signs, flaggers, and taper shall be placed as shown.

All dimensions are in inches (millimeters) unless otherwise shown.

Illinois Department of Transportation

APPROVED January 1, 2019
ENGINEER OF SAFETY PROG. AND ENGINEERING

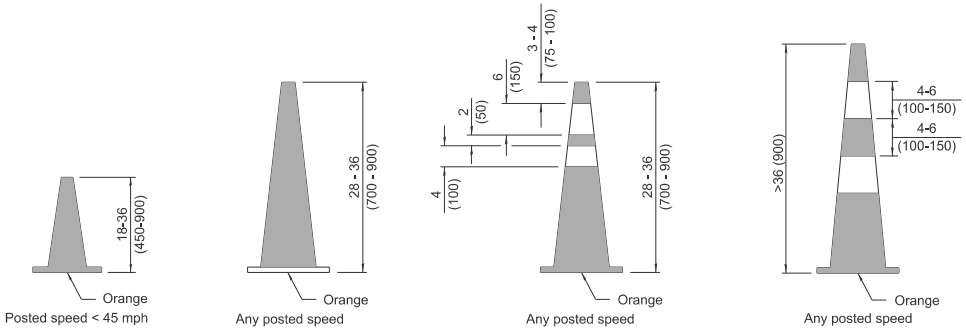
APPROVED January 1, 2019
ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-97

DATE	REVISIONS
1-1-19	Revised device spacing in taper.
1-1-11	Revised flagger sign.

LANE CLOSURE, 2L, 2W, DAY ONLY, FOR SPEEDS ≥ 45 MPH

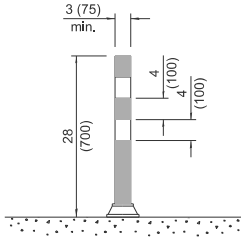
STANDARD 701201-05



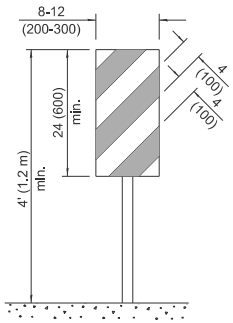
DAYTIME USE

DAY OR NIGHTTIME USE

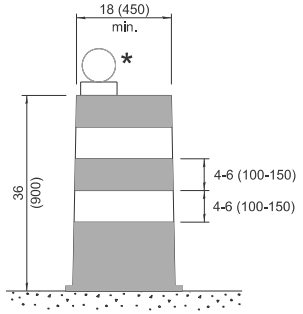
CONES



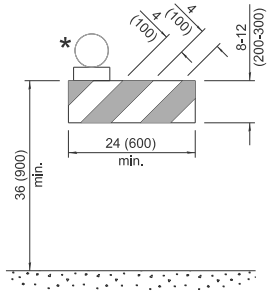
TUBULAR MARKER



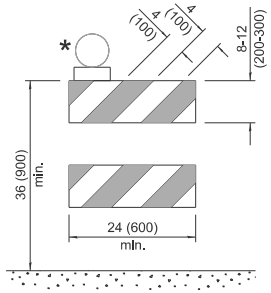
VERTICAL PANEL
POST MOUNTED



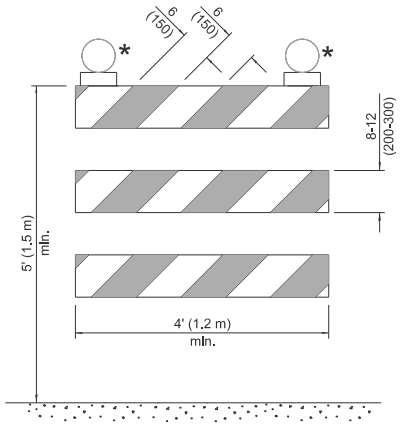
DRUM



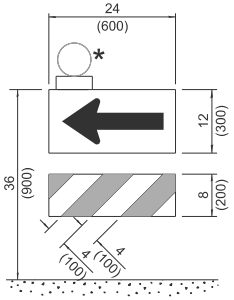
TYPE I BARRICADE



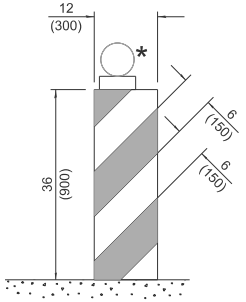
TYPE II BARRICADE



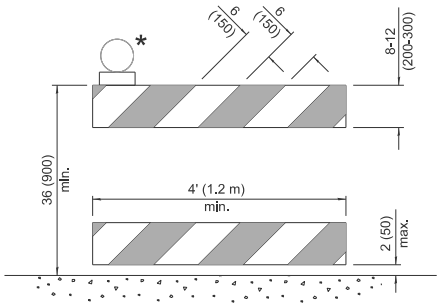
TYPE III BARRICADE



DIRECTION INDICATOR BARRICADE



VERTICAL BARRICADE



DETECTABLE PEDESTRIAN CHANNELIZING BARRICADE

* Warning lights (if required)

GENERAL NOTES

All heights shown shall be measured above the pavement surface.

All dimensions are in inches (millimeters) unless otherwise shown.

DATE	REVISIONS
1-1-25	Updated Temporary Rumble Strip Detail (sht. 3).
1-1-24	Revised Type III Barricade notes (sht. 3) & moved warning light on post mounted signs to top center.

TRAFFIC CONTROL DEVICES

(Sheet 1 of 3)

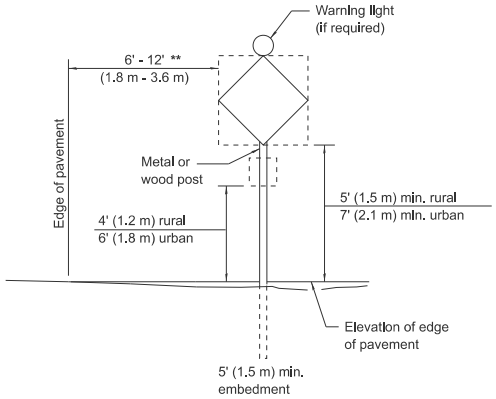
STANDARD 701901-10

Illinois Department of Transportation

APPROVED January 1, 2025
ENGINEER OF SAFETY PROG. AND ENGINEERING

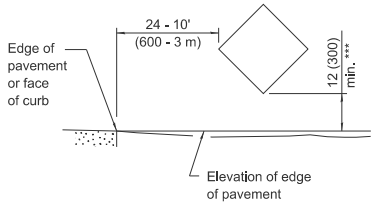
APPROVED January 1, 2025
ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-13



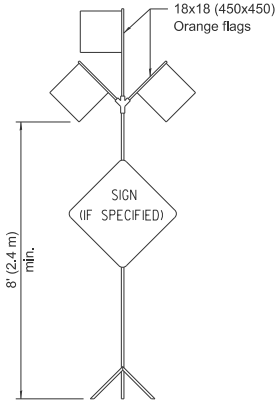
POST MOUNTED SIGNS

** When curb or paved shoulder are present this dimension shall be 24 (600) to the face of curb or 6' (1.8 m) to the outside edge of the paved shoulder.

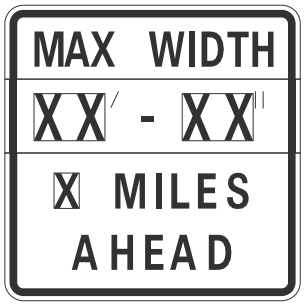


SIGNS ON TEMPORARY SUPPORTS

*** When work operations exceed four days, this dimension shall be 5' (1.5 m) min. If located behind other devices, the height shall be sufficient to be seen completely above the devices.



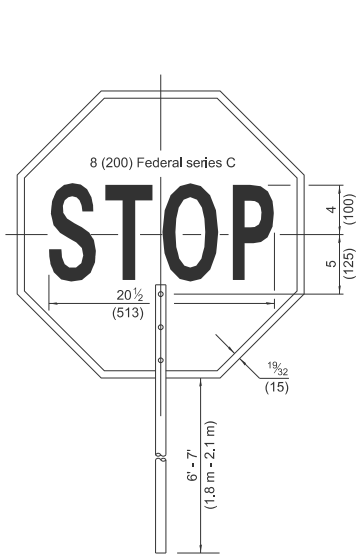
HIGH LEVEL WARNING DEVICE



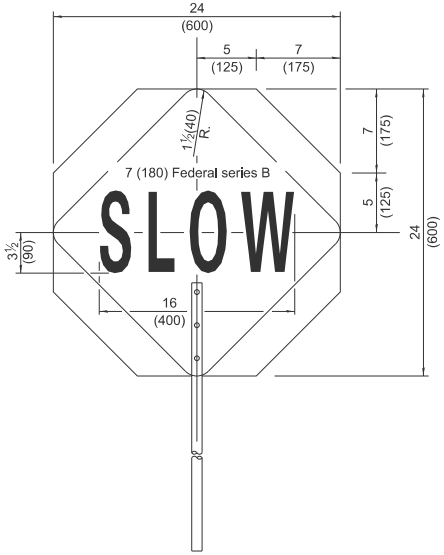
W12-I103-4848

WIDTH RESTRICTION SIGN

XX'-XX" width and X miles are variable.



FRONT SIDE



REVERSE SIDE

FLAGGER TRAFFIC CONTROL SIGN

ROAD CONSTRUCTION NEXT X MILES

G20-I104(0)-6036

END CONSTRUCTION

G20-I105(0)-6024

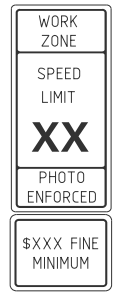
This signing is required for all projects 2 miles (3200 m) or more in length.

ROAD CONSTRUCTION NEXT X MILES sign shall be placed 500' (150 m) in advance of project limits.

END CONSTRUCTION sign shall be erected at the end of the job unless another job is within 2 miles (3200 m).

Dual sign displays shall be utilized on multi-lane highways.

WORK LIMIT SIGNING



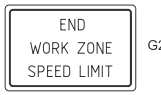
W21-III5(0)-3618

R2-1-3648

R10-I108p-3618 ****

R2-I106p-3618

Sign assembly as shown on Standards or as allowed by District Operations.



G20-I103-6036

This sign shall be used when the above sign assembly is used.

HIGHWAY CONSTRUCTION SPEED ZONE SIGNS

**** R10-I108p shall only be used along roadways under the jurisdiction of the State.

Illinois Department of Transportation

APPROVED January 1, 2025
ENGINEER OF SAFETY PROG. AND ENGINEERING

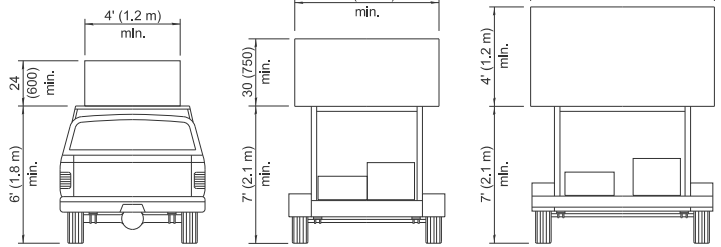
APPROVED January 1, 2025
ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-13

TRAFFIC CONTROL DEVICES

(Sheet 2 of 3)

STANDARD 701901-10

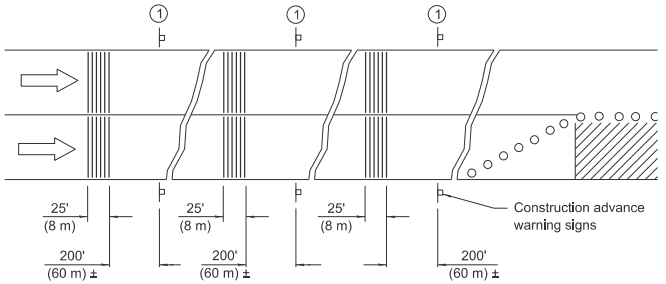


TYPE A ROOF MOUNTED

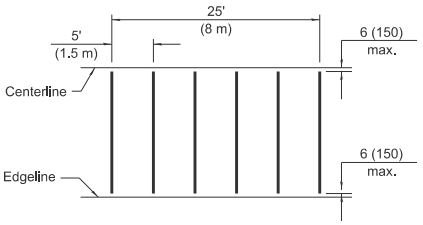
TYPE B ROOF OR TRAILER MOUNTED

TYPE C TRAILER MOUNTED

ARROW BOARDS

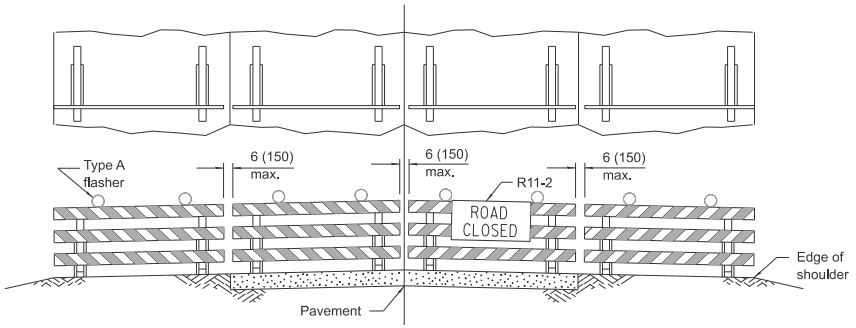


1 This sign shall be omitted when median width is less than 10' (3 m).



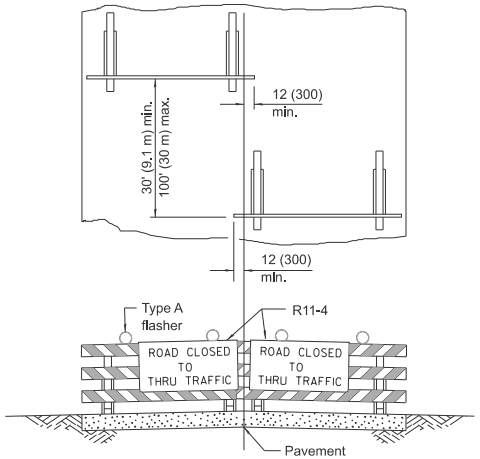
TYPICAL INSTALLATION

TEMPORARY RUMBLE STRIPS



ROAD CLOSED TO ALL TRAFFIC

Reflectorized striping may be omitted on the back side of the barricades.



ROAD CLOSED TO THRU TRAFFIC

Reflectorized striping shall appear on both sides of the barricades.

TYPICAL APPLICATIONS OF TYPE III BARRICADES CLOSING A ROAD

If a Type III barricade with an attached sign panel which meets NCHRP 350 or MASH is not available, the sign may be mounted on an NCHRP 350 or MASH temporary sign support directly in front of the barricade.

Illinois Department of Transportation

APPROVED January 1, 2025
ENGINEER OF SAFETY PROG. AND ENGINEERING

APPROVED January 1, 2025
ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-13

TRAFFIC CONTROL DEVICES

(Sheet 3 of 3)

STANDARD 701901-10

IEPA WATER PERMITS

-PERMIT NO. 0433-FY2025
-SUPPLEMENTAL PERMIT NO. 0433-1-FY2025

-PERMIT NO. 0433-FY2025

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
2520 W. Iles Ave.; Post Office Box 19276; Springfield, IL 62794-9276

Division of Public Water Supplies Telephone 217/782-1724

PUBLIC WATER SUPPLY CONSTRUCTION PERMIT

SUBJECT: ROBINSON-PALESTINE WATER COMMISSION (IL0335030)

Permit Issued to:
Robinson-Palestine Water Commission
108 East Poplar Street
Robinson, IL 62454

PERMIT NUMBER: 0433-FY2025

DATE ISSUED: March 28, 2025
PERMIT TYPE: Plant Improvement and Water Main

The issuance of this permit is based on plans and specifications prepared by the engineers/architects indicated and are identified as follows. This permit is issued for the construction and/or installation of the public water supply improvements described in this document, in accordance with the provisions of the Environmental Protection Act, Title IV, Sections 14 through 17, and Title X, Sections 39 and 40, and is subject to the conditions printed on the last page of this permit and the ADDITIONAL CONDITIONS listed below.

FIRM: Farnsworth Group, Inc.
NUMBER OF PLAN SHEETS: 128
TITLE OF PLANS: "Water Treatment Plant and Campus"
APPLICATION RECEIVED DATE: October 23, 2024

PROPOSED IMPROVEMENTS:

***The construction of a complete ground water treatment plant with a design flow rate of 2.592 MGD with all necessary treatment and appurtenances utilizing the existing wells to replace the existing WTP located in Robinson that has its reached end of life. The proposed WTP will be located adjacent to Highway 1 near the intersection with Route 33.

The water treatment plant will include a building to house equipment and chemical feeds with a back-up generator, associated raw and finished water main and connecting pipe, a raw water meter and chemical injection vault, pre-filtration gas chlorine feed system, head tank, gravity filters with backwash pump and wash water lagoon, low service pumps with wet well, high service pumps, post-filtration gas chlorine feed system, fluoride chemical feed system, potential phosphate feed system, high service pumps, ground storage tank and all other necessary appurtenances.

The construction includes the installation of a sufficiently rated diesel back-up generator with fuel containment and necessary appurtenances located adjacent to the treatment plant. The installation of approximately 1,000 feet of 12-inch and 3,300 feet of 20-inch raw and finished water main with necessary appurtenances to connect the improvement to existing infrastructure. The installation of a raw water meter vault with necessary appurtenances and chlorine injection point located adjacent to the water treatment plant prior to the head tank. The installation of a head tank with two isolatable cells and all necessary appurtenances, each with a volume of approximately 72,000 gallons, located adjacent to the water treatment plant. The installation of a separate complete pre-filtration gas chlorine feed system with all necessary appurtenances intended for the oxidation of iron and manganese, rated for approximately 0 – 200 lbs/day max with target dose of 2.0 ppm, located in an isolated chlorine gas room in the water treatment plant with sufficiently rated scrubber and necessary safety equipment and with an injection point prior to the head tank. The installation of two dual media gravity filters with all necessary appurtenances located

within the water treatment plant, each with two isolatable cells rated at approximately 450 GPM per cell with stainless steel plate style underdrain system, that is useable without support media, for uniform backwash distribution and finished water collection. The installation of approximately 24-inches of manganese green sand which includes a specific gravity of 2.4, effective size of 0.30 – 0.35 mm, uniformity coefficient of 1.6 (under alternative approval per 35 IAC 604.605(g)(4)(E)) and approximately 12-inches of anthracite media cap with a specific gravity of 1.6, effective size of 0.95 – 1.05 mm, and uniformity coefficient of 1.5. The installation of one centrifugal backwash pump rated at approximately 2,250 GPM max with the installation of a VFD and all necessary appurtenances with alternative source of backwash water in lieu of a second pump, located within the water treatment plant. The installation of a backwash water lagoon with an approximate 10 ft operating level and length to width ratio of 4:1 with a maximum volume of approximately 700,000 gallons at full, with all necessary appurtenances located adjacent to the water treatment plant. The installation of three vertical turbine low service pumps each rated at approximately 1,800 GPM max with all necessary appurtenances located within the water treatment plant. The installation of a low service pump station wet well with isolatable cells and an approximate volume of 8,228 gallons and all necessary appurtenances located within the treatment plant. The installation of three high service pumps each rated at approximately 2,250 GPM max located within the treatment plant. The installation of a separate post-filtration gas chlorine feed system with all necessary appurtenances rated for approximately 0-200 lb/day max with target dose of 1.5 ppm, located within the isolated chlorine gas room with an injection point prior to the GST. The installation of a hydrofluorosilicic acid (26%, NSF rated) fluoride chemical feed system with all necessary appurtenances located within the chemical feed room, including a peristaltic feed pump rated at approximately 0.0001 – 5.60 GPH at 100 PSI for a target dose of 0.70 ppm with 250 gallon bulk tank and 20 gallon day tank with a feed point prior to the GST with necessary anti-siphon devices and secondary controls. The installation of a complete phosphate feed system with peristaltic feed pump rated at approximately 0.0001 – 5.60 GPH at 100 PSI with 250 gallon bulk tank and 20 gallon day tank. See Additional Condition 3, the specified phosphate has not been determined. The chosen phosphate must be NSF rated and if located in the chemical feed room must be compatible with the hydrofluorosilicic acid. The installation of three centrifugal high service pumps each rated at approximately 2,250 GPM with VFDs, and all other necessary appurtenances, located within the water treatment plant. The installation of one bolted steel ground storage tank with an approximate volume of 1 MG with all necessary appurtenances located adjacent to the water treatment plant.***

ADDITIONAL CONDITIONS:

1. An operating permit must be obtained before the project is placed in service. Satisfactory disinfection must be demonstrated prior to use pursuant to Ill. Adm. Code, Title 35, Subtitle F, Section 602.310. This includes two consecutive sets of samples collected at least 24 hours apart showing the absence of coliform bacteria at all necessary locations.

2. Robinson-Palestine Water Commission and Satellites will be placed on increased lead and copper monitoring prior to the operation of the proposed water treatment plant.

3. The submitted Schedule D for anticipated water quality parameters and Desktop Study titled 'Corrosion Control Narrative' appear to support that this change will not result in lead or copper action level exceedances. This approval is based on the following, the desktop study supporting this change with recommendation of approval, confirmed lack of lead service lines following the 2022 inventory and removal, the current and historical lead and copper monitoring showing no action level exceedances or elevated lead levels, the continued use of the existing source water, the similarities in proposed treatment versus existing, the proposed water quality parameters that appear to be analogous to existing, and

including the lack of known lead service lines and acceptable lead and copper monitoring results in Robinson-Palestine Water Commission's satellite systems.

It is understood that this will be further evaluated within a reasonable period of time after beginning operation through jar testing to determine if the addition of a phosphate will be beneficial and to select an appropriate type of either orthophosphoric acid, zinc orthophosphate, or a 90/10 orthophosphate/polyphosphate blend, with the findings submitted to the Agency for review.

3. The permit approval is for the Application, Schedule D, Basis of Design, specifications and plan sheets received on August 10, 2022. This includes the Corrosion Control Narrative received December 16, 2024, additional information received February 11, 2025 and February 14, 2025 and the final revised sheets received March 12, 2025 and all other applicable emails.

DCC:CLB

cc: Farnsworth Group, Inc.
Marion Regional Office

Chris Johnston, P.E.
Manager, Permit Section
Division of Public Water Supplies

-SUPPLEMENTAL PERMIT NO. 0433-1-FY2025

Illinois Environmental Protection Agency

2520 West Iles Avenue • P.O. Box 19276 • Springfield, Illinois • 62794-9276 • 217-782-3397

JB Pritzker, Governor **James Jennings**, Acting Director

217/782-1724

November 6, 2025

Jason A. Wesner
Robinson-Palestine Water Commission
108 East Poplar Street
Robinson, IL 62454

Re: ROBINSON-PALESTINE WATER COMMISSION (Crawford County– IL0335030) Supplemental Approval for Water Treatment Plant Construction Permit No. 0433-1-FY2025

Dear Mr. Wesner:

Supplemental approval is hereby given of the changes in the plans for the following proposed water treatment plant improvements: installation of four (4) - 11 ft wide x 30 ft long x 12 ft high (each) gravity filters with granular activated carbon, each subdivided into two cells, for PFAS reduction. Each cell is rated for 300 gpm average, 600 gpm maximum, and a filtration rate of 1.4 gpm/ft^2. Filters will be operated in parallel with a rated flow of 1800 gpm with one filter out of service. The supplementary permit also includes addition of a second bolted steel ground storage tank with an approximate volume of 1 MG for additional water storage and redundancy when maintenance is required on one of the tanks. These revised plans, consisting of 11 plan sheets, a Schedule D, full scale testing plan and specifications were submitted by your engineer Farnsworth Group, Inc., and are designated as, "Water Treatment Plant and Campus".

The original permit of the plans and specifications was given March 28, 2025.

AN NPDES permit to discharge granular activated carbon filter backwash shall be obtained prior to issuance of operating permit. All PFAS sampling data shall be submitted to the Agency within one week of receiving sampling results. The results of the full scale pilot project shall be submitted with 30 days of completion.

This permit is void after November 6, 2026, unless construction of this project has started on or prior to that date.

If you have any questions or require further assistance in this matter, please contact Jaime Rabins of my staff at 217/524-3035.

Sincerely,

Chris Johnston, P.E.
Manager, Permit Section
Division of Public Water Supplies

CLJ:JAR

cc: Farnsworth Group, Inc.
Marion Regional Office

Specifications for

Robinson Palestine Water Commission

Water Treatment Plant and Campus

Funding Source:
IEPA PWS RLF
L17-6744

Robinson, IL

Project No. 0210007.00

November 2025

BOOK 1: Project and Bidding Documents
Book 2: Technical Specifications

BOOK 2 OF 2

Robinson Palestine Water Commission
Water Treatment Plant and Campus

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DIVISION 1 – GENERAL REQUIREMENTS
SECTION 011100 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. Items covered in this section

1. Scope of work in contract
2. Location of work
3. Schedule of drawings
4. Owner's representative

B. Related sections (but not limited to)

1. Div. 0 Contract Documents
2. Section 011213 - Contract Considerations
3. Section 013100 - General Coordination
4. Section 013216 - Progress Schedule and Material Submittal

1.2 PROJECT DESCRIPTION

A. Division A includes a new 1,800 gallon per minute filtration and Per- and Polyfluoroalkyl (PFAS) removal water treatment plant, maintenance and office building, storage building and site improvements that generally include the following.
   1. Water plant process equipment/components include one (1) detention tank, two (2) two-cell gravity deceleration filters, three (3) low service pumps, ground storage tank, four (4) high service pumps, a backwash pump, chemical feed equipment, air scrubber, meters, lab, office and SCADA control system.
   2. Water Treatment Building includes HVAC, mechanical, plumbing, structural, concrete, and electrical associated with the building the operation is within.
   3. Site valves, piping, fittings, and hydrants
   4. Site improvements include pavement, fencing lighting, backwash pond, drainage structures, grading, seeding, and site utilities.
   5. Office building includes offices, conference room, lavatories, customer service counter, mechanical, HVAC, and pumping facilities.
   6. Maintenance portion of the office building includes overhead doors, floor drains, ventilation, mechanical, electrical, plumbing, and HVAC associated with the operations.
   7. Electrical, instrumentation, and controls with communication of the plant operations, five (5) offsite wells, four (4) elevated storage tanks, and two (2) remote pump stations.
   8. Storage buildings shall include structure, concrete floor, overhead doors, and main doors.

B. Division B includes two (2) one million gallons (1,000,000 gallons) ground storage tanks. Work includes site grading, earthwork, foundation, steel erection, and coating. Foundation/concrete work to include valve vault, valve(s), and piping extend outside of the vault or foundation shall be included. Electrical conduits, conductors, and pressure sensors are not included in the contract.

C. Division C includes all underground water main, water services, sanitary sewer, and storm sewer within 5’ of the building/structure or foundation. In addition to the water

main, all manhole structures (excluding the head tank) shall be included. Fire hydrants to flush the head tank shall be included in Division C work. This work includes the conversion of the raw water main to finish water main. This will require multiple mobilization to connect, disconnect, tap and plug the water mains.

1. INTENT

A. It is the intent of the contract that work defined herein and on the plans provide the Owner with a complete and fully functioning water treatment plant to treat raw water to Illinois and Federal standards, a fully functioning residuals disposal system, a fully functioning and operational SCADA control system to control and operate the water treatment plant, all four (4) wells and storage tanks, and a neat, clean site with established vegetation.

B. It is also intended that the contract provide adequate training for the Owner's staff on equipment operation and maintenance. Warranty service on the work for one year following acceptance shall be provided.

C. The Owner will provide a properly certified operating staff capable of water treatment process operation with knowledge of water treatment chemistry and a maintenance staff trained in the mechanical and building trades and experienced in equipment maintenance.

2. SCHEDULE

A. Contractor and Owner recognize that time is of the essence for the completion of this Work and that Owner will suffer financial loss if the Work is not completed within the times specified in the Agreement.

B. Contractor shall supply all required resources to comply with the Owner’s project schedule as set forth in the Agreement.

C. Contractor shall schedule work in a sequence that conforms to the Owner’s project schedule and milestones. Contractor shall work overtime and/or Saturdays if the Owner’s schedule is not being met at no costs to the Owner.

D. Contractor’s Superintendent shall be required to attend weekly progress meetings and monthly coordination meetings with the Owner and the Engineer’s Resident Project Representative as described further in Section 013100. These meetings will discuss scheduling, coordination and general work conditions and requirements. Contractor shall provide monthly updated Bar Chart schedules. The schedule shall have detailed man-hours, crew make-up, submittal durations, lead times for major equipment furnished and duration for each structure in which work is to be completed.

3. OWNER OCCUPANCY

A. Full Owner Occupancy: The Owner will occupy the existing elevated tank site and existing finished water distribution system during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with the Owner’s operations.

B. Partial Owner Occupancy: The Owner reserves the right to occupy and to place and install equipment in completed areas of the building prior to Substantial Completion, provided such

occupancy does not interfere with the completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. The Certificate of Substantial Completion will be executed for each specific portion of Work to be occupied prior to Owner occupancy.
2. Obtain a Certificate of Occupancy from local building officials prior to Owner occupancy.
3. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy, the Owner will operate and maintain mechanical and electrical systems serving occupied portions of the building.
4. Upon occupancy, the Owner will assume responsibility for maintenance and custodial service for occupied portions of the building.

4. CONTRACTOR-FURNISHED ITEMS

A. The Contractor shall provide all necessary equipment, materials, fittings, pipes, and appurtenances to complete the project as shown on the plan drawings and specified herein.

B. The Contractor shall provide the necessary items in accordance with the plan drawings and specifications.

C. The Contractor shall restore all areas disturbed by work or equipment to same as original condition prior to work.

D. The Contractor shall supply a field trailer for the Engineer's resident project representative staff for the entire duration of the project. It shall include conference area and office, electrical hook-up, two phone lines and proper access/egress. This trailer will be separate from the Contractor's trailer.

E. The Contractor shall coordinate with the utilities (power, gas, telephone, etc.) to supply and install services to the project sites (water treatment plant site, construction trailers, etc.) on a temporary basis at various locations as necessary. These utility consumption costs shall be the Contractor's responsibility during construction of the project until the substantial completion date.

F. The Contractor is responsible for coordination with the utilities (power, gas, telephone, etc.) to schedule and install the permanent services to the project sites (water treatment plant, etc.) and all applicable fees and costs for materials, labor, etc. for the service installation by the utility including drops and primary metering.

5. SCHEDULE OF DRAWINGS

A. The plan drawings forming a part of the contract documents accompanying these specifications are as listed in Specification Section 000850 – Drawing Index.

1.8 COORDINATION

A. Contractor shall coordinate and inform the Owner and Engineer of all work within the project site in order to maintain full water service of the system (prior to beginning work).

B. Contractor shall coordinate work and deliveries with the Owner and Engineer.

1.9 LOCATION/ACCESS

A. Contractor's construction activities shall be limited to the project site including the water treatment plant property, easements and right-of-way as shown on the plan drawings.

B. Owner will provide access to site and obtain all required construction easements. Contractor shall confine activities to easements provided.

C. Contractor is responsible for obtaining any additional easements and rights-of-way and will be held responsible for any damage to adjacent properties not within these limits.

D. Contractor shall keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, the Owner's representative, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.10 OWNER'S REPRESENTATIVE

A. The Owner has employed Farnsworth Group, Inc. as the Engineer for the project and they will fulfill the Engineer's duties and responsibilities described in these specifications.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

A. Full system performance testing

1. Contractor shall construct and test each element of the project as required by plans and specifications.
2. The project shall be considered **Substantially Complete** and ready for Owner occupation only when the Contractor demonstrates that the full water supply and treatment system performs per requirements and is capable of continuous and extended operation as a fully functioning and integrated system.
3. During testing of completed plant and prior to connection of the finished water main to the Owner's water distribution system, Contractor shall provide required temporary piping and equipment to route water plant finished water to waste as directed by the Engineer.

B. Process Unit and Piping Disinfection

1. All process units and piping, including the ground storage tank shall be disinfected in accordance with IEPA Standards (Title 35: II, Section 652.203 Part B) prior to acceptance by Owner.
2. All new water pipeline construction shall be flushed and disinfected in accordance with IEPA Standards prior to acceptance by the Owner.
3. Raw water from the wells may be used for disinfection. Contractor shall supply all material, labor and testing laboratory services.

END OF SECTION 011100

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 011213 - CONTRACT CONSIDERATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Included in this section

1. Proposal form prices
2. Alternate bids
3. Basis of award
4. Required time of completion

B. Related sections include, but are not limited to:

1. Div. 0 Contract Documents
2. Section 011100 - Summary of Work

1.2 PROPOSAL FORM

A. Bids for the work shall be submitted on the Proposal Form provided with the contract documents

1.3 BASE BID PRICE

A. Base Bid shall be the Lump Sum price for all construction work shown on the plan drawings and itemized in these specifications which is not specifically identified as alternate bid work. The bid price shall include all costs to construct the improvements as specified and shown on the plans including labor, material, subcontractors, fees, licenses, overhead and profit. The project is tax exempt.

The BASE BID LUMP SUM PRICE shall include furnishing and installing the materials and equipment specified and shown for the BASE BID LUMP SUM PRICE. Materials and equipment named shall be in accordance with these specification sections and plans shown on the BASE BID section of the proposal form. Shop drawings must be submitted by the successful bidder that materials and equipment to be provided fully meets quality and performance requirements of the specifications and plans.

1.4 ALTERNATE BID PRICES

A. Alternate bid prices required on the bid form shall be the lump sum prices to be added or deducted from the base bid price and shall include all costs associated with each alternative Scope of Work, i.e. labor, material, subcontractors, taxes, other overhead, profit, licenses and fees.

B. Bidders are required to submit bids for the base bid and all alternate bids, unless alternate bid is noted as being voluntary.

1.5 BASIS OF CONTRACT AWARD

A. The contract for the work shall be awarded to the responsive, responsible bidder submitting the lowest total for the base bid price and any combination of additive alternate bids.

B. The Owner reserves the right to accept or reject any or all of the alternate bids.

C. The total bid price will be the algebraic sum of the base bid and any, all or none of the alternate bid prices from Paragraph 1.5.A. above and selected by the Owner.

1.6 OWNER'S RIGHT TO REJECT BIDS AND NEGOTIATE TERMS

A. The Owner reserves the right to reject any or all bids and waive or not waive any informality in the bids in accordance with Article 19 of the Instructions to Bidders.

B. After the Notice of Intent to Award is made, the Owner reserves the right to adjust the project scope to reduce the contract price. Adjustments will be made by Change Order.

1.7 REQUIRED TIME OF COMPLETION

A. Contractor shall complete the base bid work within the Contract time as set forth in the Agreement after receiving Notice to Proceed from the Owner.

B. Acceptance of any or all of the alternate bids shall not increase the contract time required for completion.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 011213

DIVISION 010000 – GENERAL REQUIREMENTS
SECTION 011420 – MECHANICAL AND ELECTRICAL COORDINATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions, Special Provisions and other Division 1 Specifications, apply to this Section.

1.2 SUMMARY

A. This Section includes the following requirements:

1. This Section shall apply to all coordination of construction work required by the entire contract documents and specification divisions even though emphasis is given herein to Mechanical and Electrical work.
2. The Contractor shall examine the premises and satisfy himself as to the existing conditions under which he will be obliged to operate in performing his work under this contract. Verify all measurements of existing and new work by actual observation at the building site.
3. All work shall fit into place in a satisfactory and neat workmanlike manner in every detail.
4. Furnish and install each item of equipment hereinafter specified, complete with all necessary fittings, supports, piping, etc., as required for a complete and operating installation.
5. All equipment and materials shall be installed according to the manufacturer's written instructions.

B. Related Sections: The following sections contain requirements that relate to this section.

1. Section 011010 – Summary of Work Sequence.
2. Section 013300 – Submittals.
3. Section 014300 – Quality Assurance and Control (QA/QC) Requirements.
4. Division 22 – Plumbing.
5. Division 23 – Heating, Ventilating, and Conditioning (HVAC).
6. Division 26 – Electrical.
7. Division 46 – Process Equipment.

1.3 STANDARDS, LAWS AND ORDINANCES

A. Supplementing the requirements of the General Conditions for compliance with laws and ordinances the Work shall meet or exceed the requirements of the following:

Building	BOCA
Plumbing	Illinois Plumbing Code, latest edition
Electrical equipment & wiring	NEC, Latest Edition

1.4 SUBSTITUTIONS AND PRODUCT OPTIONS

A. Most materials and equipment are specified by a specific manufacturer's trade name and model number to establish standards of quality and performance and not for the purpose of limiting competition. Where one or more other manufacturers are mentioned, materials and equipment manufactured by them will be acceptable providing they meet the requirements and intent of the Contract Documents. Installation and configuration changes or associated connections, appurtenances, structural, electrical or any other revisions to the contract documents to accommodate or fit the alternate equipment are a base bid contract requirement for all divisions.

B. The naming of other manufacturers beyond the "first named" manufacturer scheduled on the Drawings or in the Specifications does not imply automatic approval of their equipment. Equipment and materials other than those "first named" in these Contract Documents will be approved only if they do indeed meet the requirements and intent of these Contract Documents.

C. For all other equipment items specified herein and not required to be named in the Proposal Form the Contractor may submit substitutions, but shop drawings and product data must demonstrate that alternate equipment or materials meets or exceeds specified requirements. If the Engineer rejects equipment or materials submitted Contractor must make adjustments and resubmit without a change in the contract price.

1.5 WIRING OF CONTROL EQUIPMENT

A. The Contractor shall furnish and install all wiring and make final connections to the line side of the starter, disconnect device, or control panel. It is the Contractor's responsibility to verify that the electrical requirement of the proposed equipment is satisfied.

1.6 MAINTENANCE MANUALS

A. Comply with the requirements of Section 013300 – Submittals.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 011420

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 013100 – GENERAL COORDINATION

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDE

A. General Contractor is required to coordinate all aspects and phases of all work in the contract including shop drawing submittal, inspections, installations, start-up, cleanup and closeout.

1.2 RELATED SECTIONS

A. Include, but are not limited to:

1. Div. 0 Contract Documents
2. Section 013216 – Progress Schedule and Material Submittal
3. Section 013323 – Shop Drawings, Product Data and Samples
4. Section 017000 – Contract Closeout

1.3 DESCRIPTION

A. Coordinate scheduling, submittals, and work of the various sections of specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.

1.4 COORDINATION OF SUBMITTALS

A. Schedule and coordinate submittals specified in Sections 013216 and 013323.

B. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, or placing in service, such equipment.

C. Coordinate request for substitutions to assure compatibility of space, of operating elements, and effect on work of other sections.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.

b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of Architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Engineer indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:

    a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.

b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Review: Engineer will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Engineer determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Engineer will so inform Contractor, who shall make changes as directed and resubmit.
9. Coordination Drawing Prints: Prepare coordination drawing prints.

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
2. File Preparation Format: AutoCAD, Version 11, operating in Microsoft Windows operating system.
3. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.

a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Engineer.

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Engineer will return RFIs submitted to Engineer by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Engineer.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.

9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Engineer.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow seven working days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Engineer's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt of additional information.
3. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit a Proposal for a Change Order according to the General Conditions of the Contract Documents.

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer in writing within 10 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Engineer.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.

7. Date Engineer's response was received.

F. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within seven days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees two (2) business days prior to the meeting.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Engineer, within three (3) days of the meeting.

B. Preconstruction Conference: Engineer will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Engineer, but no later than 15 days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.
b. Phasing.
c. Critical work sequencing and long-lead items.
d. Designation of key personnel and their duties.
e. Lines of communications.
f. Procedures for processing field decisions and Change Orders.
g. Procedures for RFIs.
h. Procedures for testing and inspecting.
i. Procedures for processing Applications for Payment.
j. Distribution of the Contract Documents.
k. Submittal procedures.
l. Preparation of record documents.
m. Use of the premises and existing building.

n. Work restrictions.
o. Working hours.
p. Owner's occupancy requirements.
q. Responsibility for temporary facilities and controls.
r. Procedures for moisture and mold control.
s. Procedures for disruptions and shutdowns.
t. Construction waste management and recycling.
u. Parking availability.
v. Office, work, and storage areas.
w. Equipment deliveries and priorities.
x. First aid.
y. Security.
z. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Contractor shall schedule and conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Engineer of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.

x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Contractor shall schedule and conduct a project closeout conference, at a time convenient to Owner and Engineer, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

a. Preparation of record documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Submittal of written warranties.
d. Requirements for preparing operations and maintenance data.
e. Requirements for delivery of material samples, attic stock, and spare parts.
f. Requirements for demonstration and training.
g. Preparation of Contractor's punch list.
h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
i. Submittal procedures.
j. Coordination of separate contracts.
k. Owner's partial occupancy requirements.
l. Installation of Owner's furniture, fixtures, and equipment.
m. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Contractor shall schedule and conduct progress meetings at weekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting

shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

      1) Review schedule for next period.

   b. Review present and future needs of each entity present, including the following:

      1) Interface requirements.
      2) Sequence of operations.
      3) Resolution of component conflicts.
      4) Status of submittals.
      5) Deliveries.
      6) Off-site fabrication.
      7) Access.
      8) Site utilization.
      9) Temporary facilities and controls.
      10) Progress cleaning.
      11) Quality and work standards.
      12) Status of correction of deficient items.
      13) Field observations.
      14) Status of RFIs.
      15) Status of proposal requests.
      16) Pending changes.
      17) Status of Change Orders.
      18) Pending claims and disputes.
      19) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the minutes of each meeting.

F. Coordination Meetings: Contractor shall schedule and conduct Project coordination meetings at monthly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract work activity is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    c. Review present and future needs of each contractor/subcontractor present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Resolution of component conflicts.
        4) Status of submittals.
        5) Deliveries.
        6) Off-site fabrication.
        7) Access.
        8) Site utilization.
        9) Temporary facilities and controls.
        10) Work hours.
        11) Hazards and risks.
        12) Progress cleaning.
        13) Quality and work standards.
        14) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

DIVISION 010000 – GENERAL REQUIREMENTS
SECTION 013223 – FIELD ENGINEERING

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDE

A. Related sections include, but are not limited to:

1. General Conditions
2. Section 011100 - Summary of Work

1.2 BENCHMARKS AND LAYOUT

A. Benchmarks for establishing site elevations are shown on the plans. A coordinate system has also been established for job layout. The Owner shall provide control points and benchmarks in accordance with Article 9.05 and Article 4.03 of the General Conditions. Contractor drawings and measurements shall refer to the benchmark and coordinate system established by the Owner.

B. If errors or conflicts are discovered between benchmark elevations and/or coordinates shown on the plans and actual field measurements, the Contractor shall notify the Engineer immediately upon discovery and shall verify correct elevations before proceeding with construction.

C. At least two (2) established existing benchmarks shall be used for referencing the work as a quality control measure check before any above or below grade structure is constructed as a base bid requirement.

D. Layout and staking of all improvements shall be the contractor's responsibility.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 013223

DIVISION 010000 – GENERAL REQUIREMENTS
SECTION 013300 – SUBMITTALS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Special Provisions, and Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:

1. Contractor's construction schedule.
2. Shop Drawings.
3. Product Data.
4. Samples.
5. Quality assurance submittals.
6. O&M Manuals.

B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. Applications for Payment.
2. Performance and payment bonds.
3. Insurance certificates.
4. List of subcontractors.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section 011400 "Coordination" specifies requirements governing preparation and submittal of required Coordination Drawings.

1.3 SUBMITTAL PROCEDURES

A. Email is not an approved system infrastructure for electronic document Exchange.

B. The Contractor may provide licensing to their preferred industry-standard, industry-accepted, cloud-based system. The Contractor shall be responsible for licensing fees, providing continuous access for the Owner and Engineer, and training the Owner and Engineer in the use of the system infrastructure.

C. The Contractor is required issue project submittals including and not limited to contract documents, pay applications, shop drawings, requests for information, engineer’s supplemental instructions, requests for proposal and change orders via the agreed upon infrastructure for electronic document exchange.

D. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

    a. The Owner reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.

    a. Allow additional time if the Engineer must delay processing to permit coordination with subsequent submittals.
    b. If an intermediate submittal is necessary, process the same as the initial submittal.
    c. No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.

E. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Include the following information on the label for processing and recording action taken.

    a. Project name.
    b. Date.
    c. Name and address of the Engineer.
    d. Name and address of the Contractor.
    e. Name and address of the subcontractor.
    f. Name and address of the supplier.
    g. Name of the manufacturer.
    h. Number and title of appropriate Specification Section.
    i. Drawing number and detail references, as appropriate.

F. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Engineer using a transmittal form. The Engineer will not accept submittals received from sources other than the Contractor. Submittals must be made using Newforma Project Manager. Each submittal must be uploaded as a single PDF file.

1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including

variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart-type, contractor's construction schedule. Submit within 30 days after the date established for "Commencement of the Work."

1. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.

B. Phasing: On the schedule, show how requirements for phased completion to permit Work by separate Contractors and partial occupancy by the Owner affect the sequence of Work.

C. Work Stages: Indicate important stages of construction for each major portion of the Work, including submittal review, testing, and installation.

D. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the Work. Indicate where each element in an area must be sequenced or integrated with other activities.

E. Cost Correlation: At the head of the schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of Work performed as of the dates used for preparation of payment requests.

F. Distribution: Following response to the initial submittal, print and distribute copies to the Engineer, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

G. Schedule Updating: Revise the schedule monthly where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.5 SHOP DRAWINGS

A. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates, and similar Drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials included by sheet and detail number.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8 ½ in. x 11 in. but no larger than 36 in. x 48 in..
7. Do not use Shop Drawings without an appropriate final stamp indicating action taken.
8. Submit the shop drawing as a single PDF file to the Architect/Engineer using Newforma Project Manager or the agreed upon system infrastructure for electronic document exchange. Hardcopy shop drawings may be allowed by the Architect/Engineer on a case by case basis. A minimum of five (5) copies are required for hardcopy shop drawing submittals. After shop drawing review by the architect/engineer, the Contractor shall distribute copies of the stamped sepia as required to properly conduct the work; including requirements of the operating manual. After shop drawing review, hardcopies of the approved shop drawing shall be mailed to the Architect/Engineer to be retained in their records. The General Contractor shall retain a minimum of one hardcopy. Shop drawings shall be submitted for all items on the drawings or in the specifications.
9. Shop drawings shall show general arrangements, dimensions and details for construction. Review of shop drawings, however, shall cover general design and arrangement only. Shop drawing review by the Architect/Engineer is not for quantity. **Such review shall neither relieve this Contractor from his responsibility for proper construction or accuracy of measurements, nor from the necessity of furnishing the proper quantity and the labor and material required by the original drawings, but not shown on said drawing when approved. The Contractor and his Subcontractor(s), the Supplier and Manufacturer shall have reviewed and approved the shop drawings before items are ordered or fabricated for the project. Work shall not proceed on site without shop drawings reviewed and coordinated with all applicable trades.**
10. Shop drawings shall be submitted in sufficient time to prevent construction delay; the Contractor shall examine all shop drawings before submittal to the Architect/Engineer and shall certify that they are in accordance with his interpretation of the project.

1.6 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:

    a. Manufacturer's printed recommendations.
    b. Compliance with trade association standards.
    c. Compliance with recognized testing agency standards.
    d. Application of testing agency labels and seals.
    e. Notation of dimensions verified by field measurement.
    f. Notation of coordination requirements.

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

1.7 QUALITY ASSURANCE SUBMITTALS

A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.

B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.

1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.

C. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 1 Section "Quality Assurance and Control Requirements."

1.8 **OPERATIONS AND MAINTENANCE (O&M) MANUALS**

A. The Contractor and his Equipment Supplier/Manufacturer shall provide complete Operations and Maintenance Manuals where identified in the individual specification sections.

B. O&M Manuals shall be provided after final approval of the shop drawings but prior to on-site delivery of the equipment. O&M Manuals shall be submitted to the Engineer and Owner for review and comment.

C. O&M Manuals shall have been reviewed and corrected and provided to the Owner in final approved form a minimum of 30 working days prior to scheduled startup testing of the equipment on site.

D. The final approved O&M Manuals shall be the basis for the scheduled Operator training after startup and shall be presented and reviewed for the benefit of the Owner’s operating staff at the time of equipment startup.

E. O&M Manuals may be submitted first using Newforma Project Manager or the agreed upon system infrastructure for electronic document exchange. The final approved O&M Manuals shall be submitted as electronic files and as hardcopies in two copies in three-ring binder form and be titled, indexed and sectioned by component item.

F. The O&M Manuals shall include the following as a minimum:

1. Complete nameplate data, tabulated by component, for all components supplied.
2. Serial numbers for all components.
3. Startup data and copies of startup inspection test certificates.
4. Startup setpoints, control/operation parameters and ranges as applicable.
5. Milestone dates (manufacture, delivery, commissioning).

6. Technical data sheets edited to the equipment supplied.
7. Clean/legible sheets (original) that can be scanned.
8. Any generic data sheets, literature, information shall be edited and specific to the exact equipment supplied.
9. Information and maintenance manuals/documentation shall be supplied for all components on an applicable equipment supply.
10. Lubrication materials, suppliers and alternates and sources.
11. Part sources, parts lists, alternate sources.
12. General product literature.
13. All points of contact (address, name, phone, fax, e-mail, website) for the contractor, manufacturer, supplier, vendor, parts sources, sub-manufacturer(s), sub-supplier(s).
14. Suitable and complete excerpts of the final approved shop drawings (layouts, equipment details, component drawings, equipment lists, design and performance criteria, section/elevation drawings, schematics).
15. Warranty information.

1.9 WARRANTIES

A. Submit completed and certified Warranty Certificates for the term and requirements as detailed in the individual specification sections.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION 013300

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 013323 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDE

A. Work includes submission of schedule of exhibits and specific exhibits (shop drawings, product data and samples) required by specification sections.

1.2 RELATED REQUIREMENTS INCLUDE, BUT MAY NOT BE LIMITED TO:

A. Specified Elsewhere:

1. General Conditions
2. Other submittal requirements of individual sections.

1.3 EXHIBIT SUBMITTAL REQUIREMENTS

A. Submittals shall be in groups, with each group including complete submittals of related systems, devices, equipment, etc., (i.e., all light fixtures; all plumbing fixtures; all valves; all fans, all pumps, etc.)

B. Total number of groups submitted shall not exceed three for each Division of the Work. If only part of the required drawings in one group is submitted, action will be withheld on them until the remaining drawings are submitted.

C. **NOTE**: Information on the submittals shall conclusively specify how submitted equipment compares with that specified as to material, capacity, gauges, finish, color, accessories, working pressures, dimensions, insulation, features, etc.

D. Catalog cuts showing more than one model of a product shall be clearly marked indicating which model is being proposed.

E. Capacity and performance data shall be given in same form, units, and completeness given in Contract Documents.

F. Identifying Symbols used on Drawings (AHU-1, EF-1, L-6, etc.) shall be clearly cross-referenced on shop drawings.

G. Identify room names and numbers and buildings in which various products will be used.

H. **NOTE**: Submittals will not be reviewed for quantities or sizes.

1.4 SUBSTITUTIONS AND PRODUCT OPTIONS

A. If the specifications allow substitutions and if the Contractor desires to submit substitutions to the products or materials named in any individual section of this specification, the

following provisions shall be followed.

1. Most materials and equipment are specified by a specific manufacturer's trade name and model number to establish standards of quality and performance and not for the purpose of limiting competition. Where one or more other manufacturers are mentioned, materials and equipment manufactured by them will be acceptable providing they meet the requirements and intent of the Contract Documents.
2. The naming of other manufacturers beyond the "first named" manufacturer scheduled on the Drawings or in the Specifications does not imply automatic approval of their equipment. Equipment and materials other than those "first named" in these Contract Documents will be approved only if they do, indeed, meet the requirements and intent of these Contract Documents.
3. For all other equipment items specified herein and not required to be named in the Proposal Form, the Contractor may submit substitutions, but shop drawings and product data must demonstrate that alternate equipment or materials meet or exceed specified requirements. If the Engineer rejects equipment or materials submitted, Contractor must make adjustments and resubmit without a change in the contract price.

1.5 SUPPLIER/MANUFACTURER CERTIFICATION

A. Supplier or manufacturer certification: At the time of equipment shop drawing submittal, the Contractor shall also submit a certificate from the supplier or manufacturer stating the following:

1. The equipment meets the Specifications or stating the variance between that specified and that being offered.
2. The equipment can be installed and will operate satisfactorily in the location as shown on the plans or stating the changes that must be made so that it can be installed.
3. Guaranteeing to make any necessary revisions or replacement of the equipment if it is determined after initial start-up that it will not meet the intent of the Specifications.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 013323

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 014100 - REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDE

A. Contractor shall comply with all laws, rules and regulations governing work.

1. If Contractor observes that contract documents are at variance with specified codes, he shall give prompt written notice to the Engineer. Upon notification, the Engineer will render an interpretation. Required changes in accord with General Conditions will be issued by the Engineer by modification.
2. When Contractor performs any work knowing or having reason to know that the work is contrary to applicable laws, rules and regulations and fails to so notify the Engineer, Contractor shall pay all costs arising from correction of work to conform to requirements. However, it will not be the Contractor's prime responsibility to make certain that the contract documents are in accord with such laws, rules and regulations.
3. Contractor shall obtain all required permits and conform to applicable laws.

1.2 RELATED REQUIREMENTS INCLUDE, BUT MAY NOT BE LIMTIED TO:

A. Specified elsewhere:

1. Div. 0 Contract Documents
2. Section 011100 - Summary of Work
3. Section 013100 - General Coordination
4. Division 22 - Plumbing
5. Division 23 – Heating, Ventilating and Air Conditioning
6. Division 26 - Electrical

1.3 DEFINITIONS, ABBREVIATIONS AND SYMBOLS

A. Definitions:

1. Codes: Codes are rules, regulations or statutory requirements of government agencies.
2. Standards: Standards are requirements set by authorities, custom or general consent and established as accepted criteria.

B. Abbreviations and Symbols

AABC	ASSOCIATED AIR BALANCE COUNCIL
ac	ALTERNATING 60 HERTZ CURRENT
ACI	AMERICAN CONCRETE INSTITUTE
ADC	AIR DIFFUSION COUNCIL
AGA	AMERICAN GAS ASSOCIATION
AIC	AVAILABLE INTERRUPTING FAULT CURRENT
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
ARL	APPLIED RESEARCH LABORATORY

ASA	AMERICAN STANDARDS ASSOCIATION
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATION, AND AIR CONDITIONING ENGINEERS
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING MATERIALS
AWWA	AMERICAN WATER WORKS ASSOCIATION
AWG	AMERICAN WIRE GAUGE SIZE
AWS	AMERICAN WELDING SOCIETY
CRSI	CONCRETE REINFORCING STEEL INSTITUTE
dc	DIRECT CURRENT
ETL	ETL TESTING LABORATORIES, INC. (800/345-ETLI)
FACP	FIRE ALARM CONTROL PANEL
FDA	UNITED STATES FOOD AND DRUG ADMINISTRATION
FED	FEDERAL AGENCIES
FM	FACTORY MUTUAL ENGINEER'S CORP.
GLUMRB	GREAT LAKES-UPPER MISSISSIPPI RIVER BOARD OF SANITARY ENGINEERS
gnd.	GROUND
GP	GENERAL PURPOSE
HC	HANDICAPPED
HD	HEAVY DUTY
Hertz	FREQUENCY IN CYCLES PER SECOND (Hz)
HVAC	HEATING, VENTILATING & AIR CONDITIONING
IBC	INTERNATIONAL BUILDING CODE
IDOL	ILLINOIS DEPARTMENT OF LABOR
IDOT	ILLINOIS DEPARTMENT OF TRANSPORTATION
IDPH	ILLINOIS DEPARTMENT OF PUBLIC HEALTH
IEEE	INSTITUTE OF ELECTRICAL & ELECTRONIC ENGINEERS
IEPA	ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
IES	ILLUMINATING ENGINEERS SOCIETY
IPCEA	INSULATED POWER CABLE ENGINEERS ASSOCIATION
ISPE	ILLINOIS SOCIETY OF PROFESSIONAL ENGINEERS
NEBB	NATIONAL ENVIRONMENTAL BALANCING BUREAU
NEC	NATIONAL ELECTRICAL CODE - NFPA 70
NECA	NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NSF	NATIONAL SANITATION FOUNDATION
OL	MOTOR OVERLOAD DEVICES
OSFM	OFFICE OF STATE FIRE MARSHALL
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
PDI	PLUMBING DRAINAGE INSTITUTE
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTOR'S NATIONAL ASSOCIATION, INC.
UL	UNDERWRITER'S LABORATORIES
USEPA	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
GC	GENERAL CONTRACTOR

EC	ELECTRICAL [SUB]CONTRACTOR
HC	HEATING (HVAC) [SUB]CONTRACTOR
PC	PLUMBING [SUB]CONTRACTOR
A&E	ARCHITECT/ENGINEER
USDOL	UNITED STATES DEPARTMENT OF LABOR
TAB	TEST, ADJUST AND BALANCE

1.4 QUALITY ASSURANCE

A. Contractor:

1. Ensure that copies of specified codes and standards are readily available to Contractor's personnel.
2. Ensure that Contractor's personnel are familiar with workmanship and installation requirements of specified codes and standards.

1.5 REGULATORY REQUIREMENTS

A. Source and requirements:

1. ASTM

a. See specific specification sections for reference.

2. AWWA:

a. See AWWA specification references on various equipment specifications.

3. IBC:

a. International Building Code 2006.
b. International Mechanical Code 2012
c. International Fire Code 2012
d. NFPA Life Safety Code 2012

4. IDPH:

a. Illinois State Plumbing Code 2014

5. IEPA: (Current editions at date of bidding documents)

a. Air Pollution Standards
b. Noise Pollution Standards
c. Water Pollution Standards
d. Public Water Supplies
e. Solid Waste Standards
f. Illinois Recommended Standards for Sewage Works

6. NEC:

a. National Electric Code 2005

7. OSFM:

   a. Gasoline and Volatile Oils (Illinois Revised Statutes, ch. 17-1/2, par. 31 et seq.)
   b. Illinois Rules and Regulations for Fire Prevention and Safety, as amended 24 Dec 73 (except IOE; although fire alarm systems will be required by OSFM)
   c. Illinois Fire Prevention and Safety Laws and Fire Protection District Laws
   d. Boiler and Pressure Vessel Safety Act and Rules and Regulations (Illinois Revised Statutes, ch. 127 1/2, par. 151 et seq.)

8. "Ten State Standards"

   a. Recommended Standards for Water Works (latest edition), Great Lakes Upper Mississippi River Board of State Public Health and Environmental Managers.

B. Other codes and standards are referenced throughout the specifications establishing standards for material work and performance which must be followed.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 014100

DIVISION 010000 – GENERAL REQUIREMENTS
SECTION 014300 – QUALITY ASSURANCE AND CONTROL (QA/QC) REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Special Provisions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Quality Assurance and Control Requirements as specified herein are critical to effective execution of the specified work and will be strictly enforced. No work on any aspect of the project is to proceed without the Quality Assurance and Control Procedures implemented, maintained and executed throughout the full term of the contract work.

C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.

D. Related Sections include the following:

1. Divisions 2 through 46 Sections for specific test, inspection, quality assurance and equipment/facility check-out and start-up requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with the Plans and Specifications and/or approved Shop Drawings and specific requirements of applicable product manufacturers.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with the Plans and Specifications and/or approved Shop Drawings and specific requirements of applicable product manufacturers. Services do not include contract enforcement activities performed by Architect-Engineer or Owner.

C. Testing Agency: An entity engaged to perform specific tests, inspections, or both.

D. Testing laboratory shall mean the same as testing agency.

1.4 QUALITY ASSURANCE REQUIREMENTS

A. Pre-construction documentation
1. The contractor shall submit a plan showing the site access route for deliveries of materials (concrete, steel, masonry, etc.) And equipment, from county road 700n through the site. The plan should include the layout of any temporary roads required during construction.
2. The contractor shall provide pre-construction photographs of all access roads within the project site, from the project site to cr700n, and 200 feet of cr700n, in both east and west directions from the project entrance.
3. The contractor shall restore any damaged roadways to original pavement thickness, using the same material of construction.

B. Submittals

1. Provide submittals as outlined in SECTION 013300 – SUBMITTALS and Individual Specification Sections. Submittals shall be reviewed, processed and approved before equipment production or execution of any applicable construction.
2. **Provide a Schedule and Work Plan in accordance with SECTION 013300 – SUBMITTALS before proceeding with any construction.** The work plan shall identify “milestones” in the work. These “milestones” define critical junctures in the work at which specific elements in the project are to receive quality control inspections. In preparing the plan, the contractor must take into consideration the coordination elements and requirements of other trades working on a specific work item. The work plan shall be maintained throughout the duration of the construction and be updated on a monthly basis to reflect any changes or adjustments in the proposed work.
3. Provide work history and qualifications and assigned duties/responsibilities of all applicable project management and Supervisory personnel on the project demonstrating experience and capability to perform the contracted work and provision of adequate and comprehensive supervision of all aspects of the proposed work.
4. Submit Certification of Qualifications for the following personnel, as applicable to the contract work:

    a. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
    b. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
    c. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

d. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

e. Provide Welder; Installer; or Fabricator qualifications as outlined in the Quality Assurance Section of the individual specifications as applicable to the contract work.

END OF SECTION 014300

DIVISION 010000 – GENERAL REQUIREMENTS
SECTION 014529 – TESTING AND LABORATORY SERVICES

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDE

A. Testing laboratory services to be employed by Contractor.

1.2 RELATED REQUIREMENTS

A. Division 0 Contract documents

B. Individual Specifications Sections: Inspections and tests required, and standards for testing.

1.3 REFERENCES

A. ANSI/ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ANSI/ASTM E329 - Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

1.4 SELECTION AND PAYMENT

A. Contractor shall employ and pay for services of independent certified testing laboratories and consultant, which have been approved by the Engineer, to perform the specified inspection and testing.

B. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

1.5 LABORATORY RESPONSIBILITIES

A. Promptly notify the Engineer and Contractor of observed irregularities or nonconformance of work or products.

B. Perform additional inspections and tests as may be required by the Engineer and Contractor.

C. Submit copies of all inspections and tests performed to the Engineer.

1.6 CONTRACTOR RESPONSIBILITIES

A. Deliver to laboratory at designated location adequate samples of materials proposed to be used which require testing, together with proposed mix designs or design criteria.

B. Cooperate with laboratory personnel and provide access to Work.

C. Provide incidental labor and facilities to provide access to work to be tested, to obtain and

handle samples at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.

D. Notify Engineer and laboratory 24 hours prior to expected time for operations requiring inspection and testing services.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 014529

DIVISION 010000 – GENERAL REQUIREMENTS
SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Special Provisions and other Division 1 Specification Sections, apply to this Section.

B. Where specified herein, "Architect" or "Engineer" shall be applicable to the Architect Engineer, Resident Engineer or construction Manager.

1.2 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Temporary utilities include, but are not limited to, the following:

1. Drainage.
2. Water service.
3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
4. Heating and cooling facilities.
5. Ventilation.
6. Electric power service.
7. Lighting.

C. Support facilities include, but are not limited to, the following:

1. Temporary roads.
2. Dewatering facilities and drains.
3. Project identification and temporary signs.
4. Waste disposal facilities.
5. Field offices.
6. Storage and fabrication sheds.
7. Shipping and receiving facility.

D. Security and protection facilities include, but are not limited to, the following:

1. Environmental protection.
2. Tree and plant protection.
3. Security enclosure and lockup.
4. Barricades, warning signs, and lights.
5. Temporary enclosures.

E. Related Sections include the following:

1. Section 011010 – Summary of Work

2. Section 011400 –Coordination

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

A. Temporary Power and Water consumption for construction purposes shall be paid by the Contractor.

1.5 PROJECT CONDITIONS

A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.

1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1. Keep temporary services and facilities clean and neat.
2. Relocate temporary services and facilities as required by progress of the Work.

1.6 TEMPORARY CONSTRUCTION OFFICE SPACE

A. Contractor shall propose a location for temporary construction office spaces for review and approval by the Owner and Owner’s Representative (Resident Project Representative).

B. Provide construction office trailers located on the fenced Owner’s property.

C. Provide office a separate designated trailer for use by the Owner’s Representative (Resident Project Representative over the course of the construction project.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used. Provide materials suitable for use intended.

B. Water: Potable.

2.2 EQUIPMENT

A. General: Provide equipment suitable for use intended.

B. Field Offices: Units with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading.

C. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

D. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

E. Drinking-Water Fixtures: Containerized, bottled-water drinking-water units, including paper cup supply.

F. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.

G. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110 to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

H. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

END OF SECTION 015000

DIVISION 010000 – GENERAL REQUIREMENTS
SECTION 017000 – CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDE

A. Administrative provisions for Substantial Completion and for final acceptance.

1.2 RELATED REQUIREMENTS

A. Div. 0 Contract Documents

B. Section 017400 - Cleaning/Final Cleanup

1.3 SUBSTANTIAL COMPLETION

A. A project or process will generally be considered substantially complete once the process as a whole, including all equipment, is started-up, operational, tested and in full-service operation by the owner.

B. When Contractor considers Work is substantially complete (based on the definition in the previous paragraph), submit written notice with list of punch-list items to be completed or corrected to the Owner and Engineer.

B. Should the Engineer's Resident Project Representative (RPR) upon inspection find Work is not substantially complete, the Engineer will promptly notify Contractor in writing, listing observed deficiencies.

C. Contractor shall remedy deficiencies and send a second written notice of substantial completion.

D. When the RPR finds Work is substantially complete, the Engineer shall prepare a tentative Certificate of Substantial Completion for review and acceptance by the Owner in accordance with provisions of General Conditions.

1.4 FINAL COMPLETION

A. When Contractor considers Work is complete, submit written certification to the Owner and Engineer:

1. Contract documents have been reviewed.
2. Work has been inspected for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents, and deficiencies listed with Certificate of Substantial Completion have been corrected.
4. Work is complete and ready for final inspection.

B. Should the RPR's inspection find work incomplete, the RPR will promptly notify Contractor in writing listing observed deficiencies.

C. Contractor shall remedy deficiencies and send a second certification of final completion.

D. When the RPR finds Work is complete, the Engineer will consider closeout submittals.

1.5 CLOSEOUT SUBMITTALS

A. Evidence of Payment and Release of Liens: In accordance with Conditions of the Contract.

B. Consent of Surety to Final Payment.

C. Operation and Maintenance Manuals for all materials, products and equipment as specified in the individual specification sections.

D. Record Documents as specified in Article 7.11 of the General Conditions.

E. Copies of warranties and guarantees for specific materials, products and equipment as specified in the individual specification sections.

F. The Contractor shall provide a warranty for Project and Equipment for one year following substantial completion. Equipment process disruptions or failures during the warranty period shall be corrected by the Contractor.

1.6 STATEMENT OF ADJUSTMENT OF ACCOUNTS

A. Submit final statement in accordance with Article 11 of the General Conditions.

B. The Engineer will issue a final Change Order reflecting approved adjustments to Contract Sum not previously made by change orders.

1.7 APPLICATION FOR FINAL PAYMENT

A. Submit application for final payment in accordance with provisions of Conditions of the Contract.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 017000

DIVISION 010000 – GENERAL REQUIREMENTS
SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Related requirements specified elsewhere, include, but are not limited to:

1. General Conditions
2. Section 011010 - Summary of Work
3. Respective specification sections - Cleaning for specific products of work

B. Work includes: The work in this section is required of Contractor and each subcontractor unless otherwise specified.

1. Each Subcontractor:

a. Maintain premises and adjacent properties free of waste, debris, and rubbish caused by construction operations.
b. At completion of work, or at such other times as directed by the General Contractor and/or Engineer remove all waste, debris, rubbish, tools equipment, machinery, and surplus materials. Clean all sight-exposed surfaces; leave work clean and ready for occupancy.

2. General Contractor:

a. In addition to the work specified under "Each Contractor," supervise and coordinate the cleaning operations of all subcontractors.
b. At completion of project, leave project clean and ready for occupancy.

1.2 SAFETY REQUIREMENTS

A. Standards: Maintain project in accord with following safety and insurance standards:

1. Applicable Federal and State requirements
2. National Fire Protection Association (NFPA)

B. Conduct cleaning and disposal operations to comply with applicable Federal and State anti-pollution laws.

PART 2 PRODUCTS (Not applicable)

PART 3 EXECUTION

3.1 DURING CONSTRUCTION

A. Execute cleaning to ensure that building(s), grounds, and adjacent properties are maintained free of waste, debris, and rubbish.

B. Wet down materials and rubbish to lay dust and prevent blowing dust.

C. Daily during progress of work, clean project area and adjacent properties, and dispose of waste materials, debris, and rubbish.

D. Provide on-site containers for collection of waste materials, debris, and rubbish as required.

E. Remove waste materials, debris, and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.

F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

G. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not damage recently completed work.

H. Keep debris from accumulating in equipment and piping by covering open pipe ends and equipment.

3.2 FINAL CLEANING

A. Employ experienced workmen, or professional cleaners, for final cleaning.

B. Remove grease, dirt, stains, labels, protection, and other foreign materials from sight-exposed interior and exterior finished surfaces.

C. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces to ensure performance.

D. Contractor shall inspect for and remove debris from piping, conduit, manholes, equipment, sumps and other such areas before substantial completion and close-out. If blockages are found during warranty period to be due to debris accumulation Contractor shall correct at his expense.

E. Repair, patch, and touch up marred surfaces to specified finish, to match adjacent surfaces.

F. General Contractor: Soft broom clean all exposed concrete surfaces clean. Other paved areas with soft or stiff broom as directed.

G. Maintain finally cleaned areas until project, or designated portion thereof, is accepted by Owner.

END OF SECTION 017400

DIVISION 2 - SITE WORK
SECTION 023200 - SUBSURFACE INVESTIGATION

PART 1 GENERAL

1.1 WORK INCLUDES:

A. Logs of borings and report on findings.

B. Related Sections: The following Sections contain requirements that relate to this Section

1. Section 01300 – Submittals
2. Section 02201 – Earthwork
3. Section 02913 – Dewatering and Drainage

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 TEST BORINGS

A. Test Borings: Test borings were taken at the proposed project site. Copies of the report and boring logs are attached to this specification section.

B. Data on indicated subsurface conditions are not intended as representations or warrants of continuity of such conditions. It is expressly understood that the Owner will not be responsible for interpretations or conclusions drawn therefrom by the Contractor.

C. Additional test borings and other exploratory operations may be made by the Contractor at no additional cost to the Owner.

D. The subsurface report is included in this document for the convenience of the Contractor.

REPORT AND LOGS FOLLOW

DIVISION 03 - CONCRETE
SECTION 03 10 00 - CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1 Section Includes

A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

E. Waterstops.

1.2 Related Requirements

A. Section 03 20 00 - Concrete Reinforcing.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 04 20 00 - Unit Masonry: Reinforcement for masonry.

D. Section 05 12 00 - STRUCTURAL STEEL FRAMING: Placement of embedded steel anchors and plates in cast-in-place concrete or masonry.

1.3 Reference Standards

A. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2022.

C. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices; 2019, with Errata (2021).

1.4 Submittals

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Samples: For waterstops.

1.5 Delivery, Storage, and Handling

A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.

B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.

C. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 PRODUCTS

2.1 Formwork - General

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Chamfer outside corners of walls.

D. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

E. Comply with relevant portions of ACI 301, ACI 318, and ACI 347R.

2.2 Wood Form Materials

A. Plywood: Douglas Fir species; solid one side grade; sound undamaged sheets with clean, true edges.

2.3 Removable Prefabricated Forms

A. Preformed Steel Forms: Minimum 16 gauge, 0.0598 inch thick, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

B. Preformed Plastic Forms: Thermoplastic polystyrene form liner, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

C. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

2.4 Formwork Accessories

A. Form Ties: Factory-fabricated, removeable, or snap-off type, fiber reinforced plastic or metal form, fixed length, free of defects that could leave holes larger than 1 inch in concrete surface.

1. Ties shall be designed to resist lateral pressure of fresh concrete on forms.

2. Furnish ties that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.

3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

C. Filler Strips for Chamfered Corners: Metal, wood, PVC, or rubber strips type; 3/4 by 3/4 inch size; maximum possible lengths.

D. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 12 00.

E. Waterstops: Butyl polymer based sealant tape.

1. Configuration: As indicated on drawings.

PART 3 EXECUTION

3.1 Examination

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2 Earth Forms

A. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

1. Earth forms are not permitted for below grade concrete wall stems.

3.3 Erection - Formwork

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

D. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.

2. Class C, 1/2 inch (13 mm) for rough-formed finished surfaces.

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.

2. Do not use rust-stained steel form-facing material.

F. Align joints and make watertight. Keep form joints to a minimum.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

I. Chamfer exterior corners and edges of permanently exposed concrete.

J. Form openings, chases, offsets, linkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

K. Obtain approval before framing openings in structural members that are not indicated on drawings.

L. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

M. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

N. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

O. Coordinate this section with other sections of work that require attachment of components to formwork.

3.4 Application - Form Release Agent

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 Inserts, Embedded Parts, and Openings

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

D. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303 .

E. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement.

F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.6 Form Cleaning

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

3.7 Formwork Tolerances

A. Construct formwork to maintain tolerances required by ACI SPEC-117, unless otherwise indicated.

B. Construct and align formwork for elevator hoistway in accordance with ASME A17.1.

3.8 FORM REMOVAL AND REUSE

A. Do not remove forms or bracing until concrete has achieved at least 70 percent of its 28-day design compressive strength.

1. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

D. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

E. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.9 WATERSTOP INSTALLATION

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding,

mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

END OF SECTION 03 10 00

DIVISION 03 - CONCRETE
SECTION 03 20 00 - CONCRETE REINFORCING

PART 1 GENERAL

1.1 Section Includes

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.2 Related Requirements

A. Section 03 10 00 - Concrete Forming and Accessories.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 04 20 00 - Unit Masonry: Reinforcement for masonry.

1.3 Reference Standards

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. ACI SPEC-301 - Specifications for Concrete Construction; 2020.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

E. CRSI (DA4) - Manual of Standard Practice; 2018, with Errata (2019).

1.4 Submittals

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66. Include placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1. Do not reproduce Contract Documents or Project Files to create shop drawings.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

1.5 Quality Assurance

A. Perform work of this section in accordance with ACI SPEC-301.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 PRODUCTS

2.1 Reinforcement

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).

1. Deformed billet-steel bars.

B. Steel Welded Wire Reinforcement (WWR): Deformed type; ASTM A1064/A1064M.

1. Form: as drawn steel wire into Flat Sheets.

C. Reinforcement Accessories:

1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.

2. Joint Dowel Bars: ASTM A615/A615M, Grade 60 (60,000 psi), plain-steel bars, cut true to length with ends square and free of burrs.

3. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI (DA4) Manual of Standard Practice, of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.2 Re-bar Splicing:

A. Coupler Systems: Mechanical devices for splicing reinforcing bars.

1. Comply with ACI CODE-318 steel reinforcing design strength requirements for splices in tension and compression.

2.3 Fabrication

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Welding of reinforcement is not permitted.

C. Locate reinforcing splices not indicated on drawings at point of minimum stress.

1. Provide standard Class B lap splices unless otherwise indicated.

2. Review locations of splices with Architect.

PART 3 EXECUTION

3.1 Placement

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

D. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

E. Do not displace or damage vapor barrier.

F. Accommodate placement of formed openings.

G. Maintain concrete cover around reinforcing according to Construction Drawings.

3.2 Field Quality Control

A. An independent testing agency, as specified in Section 01 40 00 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

1. Steel reinforcement placement.

2. Steel reinforcement welding.

END OF SECTION 03 20 00

DIVISION 03 - CONCRETE
SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 Section Includes

A. Underslab Vapor Barrier.

B. Elevated concrete slabs.

C. Floors and slabs on grade.

D. Topping Slabs.

E. Concrete foundation walls, grade beams, pedestals, and footings.

F. Concrete foundations and anchor bolts for pre-engineered building.

G. Non-Shrink Cementitious or Epoxy Grout.

H. Joint devices associated with concrete work.

I. Miscellaneous concrete elements, including equipment pads and equipment pits.

J. Concrete curing.

1.2 Related Requirements

A. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork including waterstops

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 03 35 11 - Concrete Floor Finishes: Densifiers, hardeners, applied coatings, and polishing.

D. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

E. Section 32 13 13 - Concrete Paving: Sidewalks, curbs and gutters.

1.3 Reference Standards

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.

C. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.

D. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

E. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.

F. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.

G. ACI SPEC-301 - Specifications for Concrete Construction; 2020.

H. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2021.

I. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2023.

J. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens); 2021.

K. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

L. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

M. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.

N. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2014a.

O. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.

P. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

Q. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

R. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).

S. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes; 2023.

T. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements; 2017.

U. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2023, with Editorial Revision.

V. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2023.

W. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2020a.

X. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2021.

Y. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.

Z. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.

AA. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2019.

BB. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.

CC. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

DD. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

1.4 ACTION SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.

2. For vapor barrier, provide manufaucturer's data including instalation procedures and interface required with adjacent construction.

C. Mix Design: Submit proposed concrete mix design.

1. For each concrete mixture, indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.

2. For each concrete mixture, indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.

3. Indicate proposed mix design complies with admixture manufacturer's written recommendations.

4. Indicate amounts of mixing water to be withheld for later addition at the Project site.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

E. Samples: Submit samples of underslab vapor barrier/retarder to be used.

F. Test Reports: Submit report for each test or series of tests specified.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturer, and testing agency.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.

2. Admixtures.

3. Curing compounds.

4. Bonding agents.

5. Adhesives.

6. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

D. Field quality-control reports.

1.6 Quality Assurance

A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.

B. Follow recommendations of ACI PRC-305 when concreting during hot weather.

C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

D. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

E. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required byACI 301.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 PRODUCTS

2.1 Formwork

A. Comply with requirements of Section 03 10 00 - Concrete Forming and Accessories.

2.2 Reinforcement Materials

A. Comply with requirements of Section 03 20 00 - Concrete Reinforcing

2.3 Concrete Materials

A. Cement: ASTM C150/C150M, Type I/II Portland type, gray.

1. Acquire cement for entire project from same source.

B. Normal-Weight Fine and Coarse Aggregates: ASTM C 33 or better, graded.

1. Acquire all aggregates for entire project from same source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

2. Maximum Coarse-Aggregate Size: 1-1/2 inches unless noted otherwise per design mix.

3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Fly Ash: ASTM C618, Class C.

D. Water: ASTM C94/C94M and potable.

2.4 Admixtures

A. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

B. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

C. Air Entrainment Admixture: ASTM C260/C260M.

D. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.

E. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.

G. Retarding Admixture: ASTM C494/C494M Type B.

H. Water Reducing Admixture: ASTM C494/C494M Type A.

2.5 Accessory Materials

A. Underslab Vapor Retarder:

1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.

2. Water Vapor Permeance: Not more than 0.010 perms, maximum.

3. Thickness: 15 -mil, minimum.

4. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.

5. Products, Basis of Design:

a. Stego Industries, LLC; Stego Wrap Vapor Barrier (15-mil)
: www.stegoindustries.com/#sle.

B. Non-Shrink Cementitious Grout: Premixed compound consisting of nonmetallic aggregate, cement, water reducing and plasticizing agents.

1. Grout: Comply with ASTM C1107/C1107M.

2. Height Change, Plastic State; when tested in accordance with ASTM C827/C827M:

   a. Maximum: Plus 4 percent.

   b. Minimum: Plus 1 percent.

3. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch.

4. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch.

C. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, nonmetallic aggregate, and activator.

1. Minimum Compressive Strength at 7 days, ASTM C579: 12,000 pounds per square inch.

2.6 Bonding and Jointing Products

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.

B. Epoxy Bonding System:

1. Complying with ASTM C881/C881M and of Type required for specific application.

2. Two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

   a. Types I and II, nonload bearing and Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

C. Slab Isolation Joint Filler: 1/2-inch thick, height equal to slab thickness, with removable top section forming 1/2-inch deep sealant pocket after removal.

2.7 Curing Materials

A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.

B. Curing and Sealing Compound, Moisture Emission-Reducing, Membrane-Forming: Clear, liquid sealer for application to newly-placed concrete; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission.

1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.

2. Comply with ASTM C309 and ASTM C1315 Type I Class A.

3. VOC Content: Less than 100 g/L.

C. Curing Agent, Densifier, and Trowelling Aid: Penetrating, moisture-retaining, densifying, and workability-extending system spray-applied to wet concrete and floated or troweled into the surface.

1. Product:

a. W. R. Meadows, Inc; SIL-CRETE: www.wrmeadows.com/#sle..

D. Moisture-Retaining Sheet: ASTM C171.

1. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.

2. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.

E. Water: Potable, not detrimental to concrete.

2.8 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M, portland cement or hydraulic or blended hydraulic cement.

2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C109/C109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M, portland cement or hydraulic or blended hydraulic cement.

2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.

4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C109/C109M.

2.9 Concrete Mix Design

A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.

1. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

a. Fly Ash: 25 percent.

2. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, or both, as specified in ACI 301 .

1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.

D. Normal Weight Concrete for Isolated Footings and Continuous Footings:

1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.

2. Water-Cement Ratio: Maximum 0.5 for f'c = 4,000 psi.

3. Total Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size

4. Maximum Slump: 5 inches for concrete without a water-reducing or plasticizing admixture. 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

5. Maximum Aggregate Size: 1-1/2 inch.

E. Normal Weight Concrete for Detention Head Tank Base Mat Slab:

1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 5,000 pounds per square inch.

2. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.

3. Water-Cement Ratio: Maximum 0.4 for f'c = 5,000 psi

4. Total Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size

5. Maximum Slump: 5 inches for concrete without a water-reducing or plasticizing admixture. 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

6. Maximum Aggregate Size: 1-1/2 inch.

F. Normal Weight Concrete for Foundation Walls and Grade Beams:

1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.

2. Water-Cement Ratio: Maximum 0.5 for f'c = 4,000 psi.

3. Total Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2 inch nominal maximum aggregate size.

4. Maximum Slump: 4 inches for concrete without high-range water-reducing or plasticizing admixture; or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

5. Maximum Aggregate Size: 1-1/2 inch.

G. Normal Weight Concrete for Interior Slabs on Grade and Small Equipment Pads:

1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.

2. Water-Cement Ratio: Maximum 0.5 for f'c = 4,000 psi.

3. Total Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

4. Maximum Slump: 4 inches for concrete without a high-range water-reducing or plasticizing admixture; or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

5. Maximum Aggregate Size: 3/4 inch.

H. Normal Weight Concrete for Topping Slabs:

1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 5,000 pounds per square inch.

2. Water-Cement Ratio: Maximum 0.4 for f'c = 5,000 psi.

3. Total Air Content: 4.5 percent, plus or minus 1.5 percent at point of delivery.

4. Maximum Slump: 4 inches for concrete without a high-range water-reducing or plasticizing admixture; or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

5. Maximum Aggregate Size: 3/4 inch.

I. Normal Weight Concrete for Filter Pads, Trench/Pit Walls,Trench/Pit slabs, and Detention Head Tank Walls and Top Slab:

1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,500 pounds per square inch.

2. Water-Cement Ratio: Maximum 0.42 for f'c = 4500 psi.

3. Total Air Content: 3 percent, plus or minus 1 percent.

4. Maximum Slump: 4 inches for concrete without high-range water-reducing or plasticizing admixture; or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

5. Maximum Aggregate Size: 1 inch.

2.10 Mixing

A. Transit Mixers: Measure, batch, mix, and deliver concrete according to ASTM C94/C94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

1. Ticket to indicate amount of water to add on site.

PART 3 EXECUTION

3.1 Examination

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.2 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

4. Locate vertical joints in walls beside piers integral with walls, near corners, and in concealed locations where possible.

5. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.3 Preparation

A. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.

1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.

2. Use latex bonding agent only for non-load-bearing applications.

B. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade in accordance with manufacturer's instructions and ASTM E1643.

1. Lap sheet over footings and seal to foundation walls.

2. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3. Lap joints: 6 inches, minimum.

4. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

5. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

6. Repair damaged vapor retarder before covering.

C. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 .

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

3.4 Placing Concrete

A. Place concrete in accordance with ACI PRC-304.

B. Place concrete for floor slabs in accordance with ACI PRC-302.1.

C. Notify Architect not less than 24 hours prior to commencement of placement operations.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

G. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 .

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of

vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

H. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

I. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.5 Slab Jointing

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

2. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

3. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants are indicated.

4. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

5. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

E. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

3. Locate vertical joints in walls beside pedestals integral with walls, near corners, and in concealed locations where possible.

4. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

5. Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.6 Floor Flatness and Levelness Tolerances

A. An independent testing agency, as specified in Section 01 40 00, will inspect finished slabs for compliance with specified tolerances.

B. Measure floor and slab flatness and levelness within 24 hours of finishing.

C. Maximum Variation of Surface Flatness:

1. Exposed Concrete Floors: 1/8 inch in 10 ft.

2. Under Seamless Resilient Flooring: 1/8 inch in 10 ft.

3. Under Carpeting: 1/8 inch in 10 ft.

D. Correct the slab surface if tolerances are less than specified.

E. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.7 Concrete Finishing

A. Repair surface defects, including tie holes, immediately after removing formwork.

1. Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:

1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

D. Concrete Slabs: Finish to requirements of ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

1. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull- floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

a. Surfaces to Receive Scratch Finish include quarry tile, ceramic tile, and terrazzo with full bed setting system.

2. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

a. Apply float finish to surfaces indicated to receive trowel finish.

3. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

a. Surfaces to Receive Trowel Finish include carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.

4. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.

5. Other Surfaces to Be Left Exposed: Trowel Finish, minimizing burnish marks and other appearance defects.

E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.

2. Construct concrete bases to height indicated in the drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.

3. Minimum Compressive Strength: 4000 psi at 28 days.

4. Install dowel rods to connect concrete base to concrete floor.

5. Prior to pouring concrete, place and secure anchorage devices for equipment in accordance with equipment manufacturer's requirements. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

6. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.9 Curing and Protection

A. Comply with requirements of ACI 308R . Immediately after placement, protect concrete from premature drying, excessively hot (ACI 301) or cold temperatures (ACI 306R), and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

1. Normal concrete: Not less than seven days.

C. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Formed Surfaces: Cure by moist curing. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

E. Surfaces Not in Contact with Forms:

1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.

2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than four days by water ponding, water-fog spray, or absorptive cover.

a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.

b. Spraying: Spray water continuously over floor slab areas and maintain wet.

c. Saturated Burlap or Absorptive Cover: Saturate cover and place over concrete surfaces, lapping ends and sides a minimum of 12 inches; maintain in place and keep continuously wet.

3. Final Curing: Begin after initial curing but before surface is dry.

a. Moisture-Retaining Sheet: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

Cure for not less than three days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

b. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

1) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

c. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 Field Quality Control

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00. The contractor shall be responsible for scheduling all required tests.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Contractor shall notify the owner’s representative a minimum of 48 hours prior to all placement of concrete.

D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

E. Inspections:

1. Headed bolts and studs.

2. Verification of use of required design mixture.

3. Concrete placement, including conveying and depositing.

4. Curing procedures and maintenance of curing temperature.

F. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

    a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Compressive Strength Tests: ASTM C39/C39M . Test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

    b. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

G. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

H. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

I. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

J. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.11 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.12 Protection

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION 03 30 00

DIVISION 03 - CONCRETE
SECTION 03 35 11 - CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Liquid densifiers and hardeners.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

B. Section 03 30 00 - Cast-in-Place Concrete: Curing compounds that also function as sealers.

C. Section 03 3000 - Cast-in-Place Concrete: Curing agent, Densifiers.

D. Section 07 1900 - Water Repellents

E. Section 07 9200 - Sealants: Joint sealants.

F. Section 09 6500 - Resilient Flooring.

G. Section 09 6813 - Tile Carpeting.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with concrete floor placement and concrete floor curing, sealing and water proofing.

1.4 SUBMITTALS

A. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

B. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

B. Store materials in a clean, dry area in accordance with manufacturer's instructions.

C. Keep products from freezing.

D. Avoid direct contact with this product, as it may cause mild-to-moderate irritation of the eyes and/or skin

E. Protect materials during handling and application to prevent damage or contamination.

1.6 FIELD CONDITIONS

A. Do not apply concrete densifier and chemical hardener when concrete temperature is below 40 degrees F or above 135 degrees F.

B. Do not apply to frozen concre

PART 2 PRODUCTS

2.1 DENSIFIERS AND HARDENERS

A. Liquid Densifier and Hardener: Penetrating chemical compound that reacts with concrete, filling the pores, hardening, and dustproofing.

1. Composition: Lithium silicate.

2. Products:

a. W. R. Meadows, Inc; Liqui-Hard Ultra: www.wrmeadows.com/#sle.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.Ensure material can penetrate the concrete surface.

C. Ensure material can penetrate the concrete surface.

3.2 SURFACE PREPARATION

A. Protect adjacent surfaces not designated to receive treatment.

B. Clean and prepare surfaces to receive treatment in accordance with manufacturer's instructions, ensuring that all stains, oil, grease, form release agents, curing compounds, dust, and dirt are removed prior to application.

C. Fill and repair all holes, cracks, and deteriorated areas that have been removed to sound concrete.

3.3 APPLICATION

A. Apply concrete densifier and chemical hardener in accordance with manufacturer's instructions.

B. Ensure application equipment is clean and free of previously used materials.

C. Do not dilute concrete densifier and chemical hardener.

3.4 PROTECTION

A. Keep surface dry for a minimum of 48 hours after application (preferably 72 hours).

END OF SECTION 03 35 11

DIVISION 03 - CONCRETE
SECTION 03 41 00 - PRECAST STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 Section Includes

A. Roof double tees.

B. Grout packing.

C. Connection and supporting devices.

1.2 Related Requirements

A. Section 03 30 00 - Cast-in-Place Concrete: For concrete topping and connection anchor placement.

1.3 Reference Standards

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A416/A416M - Standard Specification for Low-Relaxation, Seven-Wire Steel Strand for Prestressed Concrete; 2018.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

F. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

G. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2023, with Editorial Revision.

H. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

J. IAS AC157 - Accreditation Criteria for Fabricator Inspection Programs for Reinforced and Precast/Prestressed Concrete; 2017, with Editorial Revision (2019).

K. PCI MNL-116 - Manual for Quality Control for Plants and Production of Structural Precast Concrete Products; 2021.

L. PCI MNL-123 - Connections Manual: Design and Typical Details of Connections for Precast and Prestressed Concrete; 1988.

M. PCI MNL-135 - Tolerance Manual for Precast and Prestressed Concrete Construction; 2000.

1.4 Submittals

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate standard component configurations, design loads, deflections, cambers, and bearing requirements.

C. Shop Drawings: Indicate layout, unit locations, fabrication details, unit identification marks, reinforcement, connection details, support items, dimensions, openings, and relationship to adjacent materials. Indicate design loads, deflections, cambers, bearing requirements, and special conditions.

D. Design Data: Submit design data reports indicating calculations for loadings and stresses of fabricated, designed framing.

E. Fabricator's Qualification Statement.

F. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.5 Quality Assurance

A. Designer Qualifications: Design precast concrete members under direct supervision of a Professional Structural Engineer experienced in design of precast concrete and licensed in the State in which the Project is located.

B. Fabricator Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

C. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

1.6 Delivery, Storage, and Handling

A. Handle precast members in position consistent with their shape and design. Lift and support only from support points.

B. Lifting or Handling Devices: Capable of supporting member in positions anticipated during manufacture, storage, transportation, and erection.

C. Protect members to prevent staining, chipping, or spalling of concrete.

D. Mark each member with date of production and final position in structure.

PART 2 PRODUCTS

2.1 Precast Units

A. Precast Structural Concrete Units: Comply with PCI MNL-116, PCI MNL-120, PCI MNL-123, PCI MNL-135, ACI CODE-318, and applicable codes.

1. Design components to withstand dead loads and design loads in the configuration indicated on drawings and as follows:

a. Maximum Allowable Deflection of Roof Assemblies: 1/180 of span , cambered to achieve slope to drain.

2. Calculate structural properties of framing members in accordance with ACI CODE-318.

3. Design members exposed to the weather to provide for movement of components without damage, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to seasonal or cyclic day/night temperature ranges.

4. Design system to accommodate construction tolerances, deflection of other building structural members and clearances of intended openings.

2.2 Materials

A. Cement: White Portland type, complying with ASTM C150/C150M, Type I/II.

B. Other Cementitious Materials:

1. Fly Ash or Natural Pozzolans: Comply with ASTM C618.

C. Aggregate, Sand, Water, Admixtures: Determined by precast fabricator as appropriate to design requirementsand PCI MNL-116.

2.3 Reinforcement

A. Tensioning Steel Tendons: ASTM A416/A416M, Grade 250 (1725); seven-wire stranded steel cable; low-relaxation type; full length without splices; weldless; uncoated.

B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).

C. Steel Welded Wire Reinforcement: ASTM A1064/A1064M plain type or deformed type; in flat sheets; unfinished.

2.4 Fabrication

A. Comply with fabrication procedures specified in PCI MNL-116.

B. Maintain plant records and quality control program during production of precast members. Make records available upon request.

C. Ensure reinforcing steel, anchors, inserts, plates, angles, and other cast-in items are embedded and located as indicated on shop drawings.

D. Tension reinforcement tendons as required to achieve design load criteria.

E. Provide required openings with a dimension larger than 10 inches and embed accessories provided under other sections of the specifications, at indicated locations.

F. Exposed Ends at Stressing Tendons: Fill recess with non-shrink grout, trowel flush.

2.5 Fabrication Tolerances

A. Comply with fabrication tolerances specified in PCI MNL-135.

2.6 Finishes

A. Ensure exposed-to-view finish surfaces of precast concrete members are uniform in color and appearance.

B. Plant Finish: Normal plant finish; surface may contain small surface holes caused by air bubbles, minor chips or spalling at edges or ends, without major discoloration.

2.7 Accessories

A. Connecting and Supporting Devices; Anchors and Inserts: Plates, angles,items cast into masonry, and inserts complying with PCI MNL-123 and as follows:

1. Material: Carbon steel complying with ASTM A36/A36M.

2. Finish: Prime painted, except where device surfaces will be in contact with concrete or masonry or will require field welding.

B. Grout: Non-shrink, non-metallic, minimum yield strength of 10,000 psi at 28 days.

C. Bearing Pads: Neoprene (Chloroprene) or Random Fiber Reinforced Elastomeric; Shore A Durometer 80±10; 1/2 inch thick.

D. Prime Paint: Zinc rich alkyd type.

PART 3 EXECUTION

3.1 Examination

A. Verify that site conditions are ready to receive work and field measurements are as indicated on shop drawings.

3.2 Preparation

A. Prepare support equipment for the erection procedure, temporary bracing, and induced loads during erection.

3.3 Erection

A. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.

B. Maintain temporary bracing in place until final support is provided. Protect members from staining.

C. Provide temporary lateral support to prevent bowing, twisting, or warping of members.

D. Adjust differential camber between precast members to tolerance before final attachment.

E. Install bearing pads.

F. Grout joints between members at roof locations.

3.4 Tolerances

A. Erect members level and plumb within allowable tolerances.

B. Comply with PCI MNL-135 for erection tolerances.

C. When members cannot be adjusted to comply with design or tolerance criteria, cease work and advise Architect. Execute modifications as directed.

3.5 Protection

A. Protect members from damage caused by field welding or erection operations.

3.6 Cleaning

A. Clean weld marks, dirt, or blemishes from surface of exposed members.

END OF SECTION 03 41 00

DIVISION 04 - MASONRY
SECTION 04 20 00 - UNIT MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete masonry units.

B. Color added concrete masonry units.

C. Mortar, colored mortar.

D. Grout.

E. Reinforcement and anchorage.

F. Flashings.

G. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Installation of cast-in-place fundation and floor slabs.

B. Section 04 23 00 - Glass Unit Masonry.

C. Section 04 7200 - Cast Stone Masonry: Cast stone sills and masonry banding.

D. Section 04 7300 - Manufactured Stone Masonry: Manufactured stone veneer.

E. Section 05 1200 - Structural Steel Framing: Steel embedded anchors and bearing plates in masonry.

F. Section 05 50 00 - Metal Fabrications: Loose steel lintels.

G. Section 06 10 00 - Rough Carpentry: Structural wood framing and nailing strips built into masonry.

H. Section 07 21 00 - Thermal Insulation: Insulation for cavity spaces.

I. Section 07 25 00 - Weather Barriers: Water-resistive barriers applied to exterior face of backing sheathing or unit masonry substrate.

J. Section 07 62 00 - Sheet Metal Flashing and Trim: Surface attached masonry flashings.

K. Section 07 92 00 - Joint Sealants: Joint sealants.

1.3 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.

D. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

E. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.

F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

G. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2022.

H. ASTM C91/C91M - Standard Specification for Masonry Cement; 2023.

I. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2022.

J. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

K. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

L. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

M. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

N. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.

O. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

P. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2023.

Q. ASTM C1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength; 2022.

R. ASTM C1148 - Standard Test Method for Measuring the Drying Shrinkage of Masonry Mortar; 1992a (Reapproved 2014).

S. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2023a.

T. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015, with Editorial Revision (2022).

U. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2020.

V. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

W. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.4 SUBMITTALS

A. Product Data: Provide data for masonry units (including special shapes), fabricated wire reinforcement, mortar, grout and masonry accessories.

1. Include manufacturer, brand name, dimensions, shape(s) and type.

2. For pre-packaged mortar and grout include description of type and proportion of ingredients.

B. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for masonry support system.

1. Reinforcing steel shop drawings complying with ACI 315

a. Detail bending, lap splice lengths, and placement of masonry reinforcing.

b. Plan showing masonry embed layout.

c. Plan indicating and dimensioning control joint locations.

d. Elevations of reinforced walls showing locations and reinforcement for jambs, lintels, control joints, bond beams, and applicable splices.

e. Do not reproduce Contract Documents or Project Files to create shop drawings.

2. Stainless steel through-wall flashing details showing location(s), shape(s) and dimension(s) for fabrication and installation.

C. Samples: Submit four samples of smooth faced units masonry units with color added to illustrate final color, texture, and extremes of color range.

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

E. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.

F. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

G. Installer's Qualification Statement.

1.5 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:

1. Size: Standard units with nominal face dimensions of 8 inches high x 16 inches long and nominal depth of 8 inches unless shown otherwise. See drawings.

2. Special Shapes: Provide non-standard blocks configured for corners.

a. Provide bullnose units for outside corners where exposed to view in final construction..

3. Load-Bearing Units: ASTM C90, normal weight below grade and lightweight above grade.

    a. 2-core Hollow block, as indicated.

4. Nonloadbearing Units: ASTM C129.

    a. 2-core Hollow block, as indicated.

        1) Provide solid units where shown or otherwise required.

    b. Lightweight.

5. Units with Integral Water Repellent: Concrete block units as specified in this section with polymeric liquid admixture added to concrete masonry units at the time of manufacture.

    a. Performance of Units with Integral Water Repellent:

        1) Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours.

            a) No water visible on back of wall above flashing at the end of 24 hours.

            b) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.

            c) No more than 25 percent of wall area above flashing visibly damp at end of test.

        2) Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.

        3) Compressive Strength: ASTM C1314; maximum 5 percent decrease.

        4) Drying Shrinkage: ASTM C1148; maximum 5 percent increase in shrinkage.

    b. Color:

    c. Use only in combination with mortar that also has integral water repellent admixture.

    d. Use water repellent admixtures for masonry units and mortar by a single manufacturer.

2.2 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C91/C91M, Type M below grade, Type S above grade.

B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.

1. Not more than 0.60 percent alkali.

C. Hydrated Lime: ASTM C207, Type S.

D. Mortar Aggregate: ASTM C144.

E. Grout Aggregate: ASTM C404.

F. Water: Clean and potable.

2.3 REINFORCEMENT AND ANCHORAGE

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; uncoated.

B. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

C. Single Wythe Joint Reinforcement: ASTM A951/A951M.

1. Type: Ladder.

2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.

3. Size: 0.1144 inch (9-gage) side rods with 0.1144 inch (9-gage) cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch at interior face, 5/8 inch at exterior exposed faces, and 5/8 inch on faces below grade or in contact with soil of mortar coverage on each exposure.

D. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face.

E. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch .

2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.

a. Anchor Section: Corrosion-resistant, self-drilling, eye-screw designed to receive wire tie. Eye-screw has spacer that seats directly against framing and is same thickness as sheathing and has gasketed, washer head that covers hole in sheathing.

b. Fabricate sheet metal anchor sections and other sheet metal parts from 1.05-inch- thick, steel sheet, galvanized after fabrication.

c. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.187-inch- diameter, hot-dip galvanized steel wire.

d. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.

F. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.

1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.

2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.

3. Vertical adjustment: Not less than 3-1/2 inches.

G. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

2.4 FLASHINGS

A. Metal Flashing Materials:

1. Stainless Steel Flashing: ASTM A666/A666M, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.

B. EPDM Flashing: ASTM D4637/D4637M, Type I, 0.040 inch thick.

C. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.

D. Termination Bars: Stainless steel; compatible with membrane and adhesives.

E. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.5 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.

C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.

D. Building Paper: ASTM D226/D226M, Type I ("No.15") asphalt felt.

E. Weeps:

1. Type: Polyester mesh.

2. Manufacturers:

a. Blok-Lok Limited; _____: www.blok-lok.com/#sle.

b. CavClear, a Division of Archovations Inc; _____: www.cavclear.com/#sle.

F. Cavity Vents:

1. Type: Polyester mesh.

2. Color(s): As selected by Architect from manufacturer's full range.

G. Drainage Fabric: Polyester or polypropylene mesh bonded to a water and vapor-permeable fabric.

H. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.6 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.

1. Masonry below grade and in contact with earth: Type M.

2. Exterior, loadbearing masonry: Type S.

3. Exterior, non-loadbearing masonry: Type N.

4. Interior, loadbearing masonry: Type S.

5. Interior, non-loadbearing masonry: Type O.

B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.4 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:

1. Bond: Running.

2. Coursing: One unit and one mortar joint to equal 8 inches.

3. Mortar Joints: Concave.

3.5 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

F. Interlock intersections and external corners.

G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

J. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.6 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

B. Install cavity vents in veneer and cavity walls at 32 inches on center horizontally below shelf angles and lintels and near top of walls.

3.7 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.8 REINFORCEMENT AND ANCHORAGE - GENERAL and SINGLE WYTHE MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

3.9 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

B. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.10 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

B. Extend EPDM flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel thru wall flashing as indicated on the drawings.

C. Lap end joints of flashings as indicated on the drawings, and seal watertight with flashing sealant/adhesive.

3.11 LINTELS

A. Install loose steel lintels over openings.

B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.

1. Reinforce masonry lintels as indicated in the Drawings.

2. Do not splice reinforcing bars.

3. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

4. Place and consolidate grout fill without displacing reinforcing.

5. Allow masonry lintels to attain specified strength before removing temporary supports.

C. Maintain minimum 8 inch bearing on each side of opening.

3.12 GROUTED COMPONENTS

A. Reinforce bond beams with 2, No. 5 bars, 3 1/2 inches from bottom web.

B. Lap splices minimum 48 bar diameters.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

E. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.13 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.14 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.

3.15 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

B. Maximum Variation from Alignment of Columns: 1/4 inch.

C. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

D. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

E. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

F. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

G. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.16 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.17 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Coordinate cleaning products and methods with Water Repellent and Anti-Graffiti Coating manufactuers.

3.18 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION 04 20 00

DIVISION 04 - MASONRY
SECTION 04 23 00 - GLASS UNIT MASONRY

PART 1 GENERAL

1.1 Section Includes

A. Glass masonry units.

B. Setting and pointing materials.

C. Perimeter treatment.

1.2 Related Requirements

A. Section 04 2000 - Unit Masonry: Concrete Masonry.

B. Section 05 1200 - Structural Steel Framing: Structural steel lintels.

C. Section 07 2500 - Weather barriers: Coordination with weather barrier installation.

D. Section 07 92 00 - Joint Sealants: Sealing joints between glass unit masonry units and adjacent construction.

1.3 Reference Standards

A. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2023.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

C. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

1.4 Submittals

A. Product Data: Provide data for glass units and accessories.

B. Samples: Submit two glass units illustrating color, design, and face pattern.

C. Manufacturer's Installation Instructions: Indicate special procedures, positioning of reinforcement, perimeter conditions requiring special attention.

1.5 Quality Assurance

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three(3) years of documented experience.

1.6 Delivery, Storage and Handling

A. Accept glass units on site on pallets; inspect for damage.

1.7 Field Conditions

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.1 Glass Units

A. Manufacturers:

1. GBA Architectural Products + Services; Imperial Line Glass Block, 4 inch Premiere Series: www.gbaproducts.com/#sle.

2. Mulia, Inc; Thick Series: www.muliainc.com/glassblcok/#sle.

3. Nippon Electric Glass Co. Ltd; Basic Glass Block: www.neg.co.jp/arch.

4. Seves Glass Block, Inc; 4 inch Premiere Series: www.sevesglassblock.com/#sle.

B. Hollow Glass Units: Permanently seal hollow unit by heat fusing joint; with joint key to assist mortar bond.

1. Nominal Size: 8 inch by 8 inch by 4 inch.

2. Color: Clear glass.

3. Pattern and Design: As indicated by manufacturer's designation.

4. Insulation Value: U value of 0.512 BTU/sq ft/h/degree F.

5. Compressive Strength: 400-600 psi.

6. Visible Light Transmittance: 60 percent.

7. Shading Coefficient: 0.655.

2.2 Accessories

A. Joint Reinforcement: Use ladder type joint reinforcement, unless otherwise indicated.

B. Single Wythe Joint Reinforcement: ASTM A951/A951M.

1. Type: Ladder.

2. Material: Stainless steel complying with ASTM A580/A580M Type 304.

3. Size: 0.1483-inch side rods with 0.1483-inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

C. Expansion Strips: Dense glass fiber matting, 7/16 inches by 4 inches nominal size.

D. Panel Anchors: Steel strips, at least 20 gauge, 0.0359 inch thick by 1-3/4 inches wide; punched with three rows of elongated holes, pattern staggered, stainless steel.

E. Perimeter Channel: Extruded aluminum channel profile, 4-3/4-inch by 1-1/4-inch by 1/8-inch size, one piece per length installed, uncoated finish.

F. Asphalt Emulsion: Water based.

G. Joint Sealant: See Section 07 92 00.

1. Color(s): As selected by Architect from full range of available colors availab.

2.3 Mortar and Pointing Material

A. Mortar: ASTM C270, Type N using the Proportion specification as specified in Section 04 05 11.

B. Pointing Mortar: ASTM C270, Type N using the Proportion specification with maximum 2 percent ammonium stearate or calcium stearate per cement weight, with white sand aggregate.

2.4 Mortar Mixing

A. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.

B. Do not use anti-freeze compounds to lower the freezing point of mortar.

C. If water is lost by evaporation, re-temper only within two hours of mixing.

D. Use mortar within two hours after mixing at temperatures of 90 degrees F, or two-and-one-half hours at temperatures under 40 degrees F.

PART 3 EXECUTION

3.1 Examination

A. Verify that openings are ready to receive work.

3.2 Preparation

A. Clean glass units of substances that may impair bond with mortar or sealant.

B. Establish and protect lines, levels, and coursing.

C. Protect elements surrounding the work of this section from damage and disfigurement.

3.3 Installation - Glass Units

A. Erect glass units and accessories in accordance with manufacturer's instructions.

B. Locate and secure perimeter metal channel.

C. Provide full mortar joints. Furrowing is not permitted. Remove excess mortar.

D. Maintain uniform joint width of 1/4 inch.

E. Place panel reinforcement at every horizontal joint in full mortar bed and at first course above and below openings within the glass unit panel.

F. Lap reinforcement joints 6 inches. Discontinue reinforcement at expansion joints.

G. Isolate perimeter metal channel with shims on all four sides

H. Isolate panel within perimeter metal channel on sides and top with expansion strips concealed within perimeter trim. Keep expansion joint voids clear of mortar.

I. Shore assembly until setting bed will maintain panel in position without movement.

J. Pointing With Mortar: Interior.

1. Before mortar sets, rake out joints to depth of 5/8 to 3/4 inch.

2. Fill joints with pointing mortar; press into joint to eliminate voids; neatly tool surface to a concave profile.

3. Remove excess pointing mortar.

K. Pointing With Sealant: Exterior.

1. Locations: Between perimeter trim and adjacent construction and at raked mortar joints within glass unit masonry assembly.

2. Install sealant in accordance with sealant manufacturer's instructions.

3. Before mortar sets, rake out joints to depth equal to but not deeper than joint width.

4. After mortar is cured, place bond breaker tape on back surface of joint.

5. Apply pointing sealant to joints; press into joint to eliminate voids; neatly tool surface to concave profile.

6. Remove excess sealant.

3.4 Tolerances

A. Variation From Joint Width: Plus 1/8 inch and minus 0 inches.

B. Maximum Variation from Plane of Unit to Adjacent Unit: 1/32 inch.

C. Maximum Variation of Panel from Plane: 1/8 inch.

3.5 Cleaning

A. Clean and polish faces of glass unit masonry, using materials and technique that will not scratch or deface units.

B. Clean exposed surfaces of aluminum trim with clean, soft cloth and mild hand soap using gentle rubbing action. Do not use abrasive or solvent type cleaners, detergents, or paint removers.

3.6 Protection

A. After glass unit masonry unit panel installation, protect installed work from damage caused by subsequent operations at project site.

END OF SECTION 04 23 00

DIVISION 04 - MASONRY
SECTION 04 72 00 - CAST STONE MASONRY

PART 1 GENERAL

1.1 Section Includes

A. Architectural cast stone.

B. Units required are indicated on drawings as "cast stone".

1.2 Related Requirements

A. Section 04 20 00 - Unit Masonry: Installation of cast stone in conjunction with concrete masonry.

B. Section 04 2000 - Unit Masonry: Mortar for use with cast stone.

C. Section 04 2300 - Glass Unit Masonry: Installation of cast stone in conjunction with glass unit masonry.

D. Section 047300 - Manufactured Stone Masonry: Installation of cast stone in conjunction with manufacturerd stone masonry.

E. Section 07 92 00 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.3 Reference Standards

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2019.

D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2019, with Editorial Revision (2020).

E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

F. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.

G. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

I. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2017.

1.4 Submittals

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Test results of cast stone components made previously by the manufacturer.

C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

D. Verification Samples: Pieces of actual cast stone components not less than 6 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.

E. Full-Size Samples, For Review:

1. Basic Shapes: One of each.

2. Accent, Trim and Specialty Shapes: One of each.

F. Manufacturer's Qualification Data: Documentation showing compliance with specified requirements.

1.5 Quality Assurance

A. Manufacturer Qualifications:

1. A firm with a minimum of 5 years experience producing cast stone of types required for project.

2. Current producer member of the Cast Stone Institute.

3. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 Delivery, Storage, and Handling

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.1 Manufacturers

A. Architectural Cast Stone:

1. Any current producer member of the Cast Stone Institute.

2.2 Architectural Cast Stone

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.

1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.

2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.

3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.

4. Color: Selected by Architect from manufacturer's full range.

5. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.

1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.

2. Unless otherwise indicated on drawings, provide:

   a. Wash or slope of 1:12 on exterior horizontal surfaces.

   b. Drips on projecting components, wherever possible.

   c. Outside corners: Either special shape(s) or quirk-mitered corners.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI CODE-318.

2.3 Materials

A. Portland Cement: ASTM C150/C150M.

1. For Mortar: Type I or II, except Type III may be used in cold weather.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.

E. Admixtures: ASTM C494/C494M.

F. Water: Potable.

G. Reinforcing Bars: ASTM A615/A615M, Grade 40 (40,000 psi), deformed bars, galvanized.

1. Galvanized in accordance with ASTM A767/A767M, Class I.

H. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.

I. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

J. Mortar: Portland cement-lime, As specified in Section 04 200 - Unit Masonry .

K. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

PART 3 EXECUTION

3.1 Examination

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.2 Installation

A. Install cast stone components in conjunction with unit masonry, complying with requirements of Section 04 20 00.

B. Mechanically anchor as shown. Where not shown, mechanically anchor as recommended by the Cast Stone Institute.

C. Setting:

1. Drench cast stone components with clear, running water immediately before installation.

2. Set units in a full bed of mortar unless otherwise indicated.

3. Fill vertical joints with mortar.

4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.3 Tolerances

A. Joints: Make all joints 3/8 inch, except as otherwise detailed.

1. Rake mortar joints 3/4 inch for pointing.

2. Remove excess mortar from face of stone before pointing joints.

3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.

4. Leave the following joints open for sealant:

a. Joints in projecting units.

b. Joints labeled "expansion joint".

B. Installation Tolerances:

1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.

2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.

3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.

4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.4 Repair

A. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.

B. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.

C. Repair methods and results subject to Architect 's approval.

3.5 Cleaning

A. Clean completed exposed cast stone after mortar is thoroughly set and cured.

1. Wet surfaces with water before applying cleaner.

2. Apply cleaner to cast stone in accordance with manufacturer's instructions.

3. Remove cleaner promptly by rinsing thoroughly with clear water.

4. Do not use acidic cleaners.

3.6 Protection

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION 04 72 00

DIVISION 04 - MASONRY
SECTION 04 73 00 - MANUFACTURED STONE MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Adhered manufactured stone masonry veneer (AMSMV).

B. Installation materials.

C. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry: Concrete masonry backup, through-wall masonry flashings.

B. Section 04 7200 - Cast Stone Masonry: Architectural cast stone sills.

C. Section 06 10 00 - Rough Carpentry: Wood stud backup for AMSMV; plywood and OSB sheathing.

D. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

E. Section 07 92 00 - Joint Sealants: Sealing penetration joints.

1.3 REFERENCE STANDARDS

A. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2012 (Revised).

B. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2012.

C. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

D. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2017.

E. ASTM C1670/C1670M - Standard Specification for Adhered Manufactured Stone Masonry Veneer Units; 2017.

F. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.

G. ASTM C1780 - Standard Practice for Installation Methods for Adhered Manufactured Stone Masonry Veneer; 2017.

H. ICC-ES AC51 - Acceptance Criteria for Precast Stone Veneer; 2016.

I. NCMA (AMSV) - Installation Guide and Detailing Options for Compliance with ASTM C1780 for Adhered Manufactured Stone Veneer; Current Edition, Including All Revisions.

J. NCMA TEK 20-01 - Key Installation Checkpoints for Manufactured Stone Veneer; 2014.

K. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.4 SUBMITTALS

A. Product Data: Provide data for AMSMV units and mortar, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Color charts.

4. Installation methods.

B. Shop Drawings: Submit detail drawings depicting proper installation and flashing techniques. Coordinate locations with those found on drawings.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Evaluation Service Reports: Show compliance of AMSMV with specified requirements of ICC-ES AC51.

E. Manufacturer's Certificate: Certify that AMSMV units meet or exceed specified requirements.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified, with at least five years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Prevent mechanical damage and contamination by other materials.

C. Protect products from precipitation combined with freezing temperatures. Do not install products with visible frozen moisture.

D. Protect Portland cement based materials from moisture and humidity. Store under cover off the ground in a dry location.

1.7 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

B. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

C. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

1.8 WARRANTY

A. Correct defective work within a five year period after Date of Substantial Completion.

B. Provide 50 year manufacturer warranty for AMSMV.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Adhered Manufactured Stone Masonry Veneer (AMSMV):

1. Cultured Stone; Country Ledgestone: www.culturedstone.com/#sle.

2. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ADHERED MANUFACTURED STONE MASONRY VENEER (AMSMV)

A. AMSMV: Cast masonry units using a mixture of cement, lightweight aggregates, concrete additives and color pigments to replicate appearance of natural stone and

designed to be applied with a cementitious mortar to a backing surface, complying with ASTM C1670/C1670M and ICC-ES AC51.

1. Style: Country Ledgestone.

2. Color: As selected by the Architect from manufacturer's standard colors.

3. Exterior Walls: Provide with single color and texture throughout.

B. AMSMV Trim: Provide one piece pre-made corner stones and one piece pre-made stone returns at recessed openings.

2.3 MORTAR APPLICATIONS

A. Use only factory premixed packaged dry materials for mortar, with addition of water only at project site.

1. Exception: If a specified mix design is not available in a premixed dry package, provide equivalent mix design using standard non-premixed materials.

B. Mortar Color: Natural gray unless otherwise indicated.

C. Scratch Coat Mortars: Scratch coat mortars for application directly to concrete masonry backup.

1. Site-Mixed: ASTM C270, Type N, using the Proportion Method.

2. Prepackaged/Preblended: ASTM C1714/C1714M, Type N.

D. Setting Bed Mortars: Setting bed used to adhere AMSMV units to scratch coat mortar.

1. Prepackaged/Preblended Latex Modified: ANSI A118.4 or ANSI A118.15.

2.4 ACCESSORIES

A. Flashings: See Section 04 20 00.

B. Cleaning Solution: Non-acidic, not harmful to AMSMV work or adjacent materials, approved by AMSMV manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that backup wall system construction complies with AMSMV manufacturer's instructions, NCMA (AMSV), NCMA TEK 20-01, ASTM C1780 and ICC-ES AC51.

B. Verify that substrates to receive mortar scratch coat or setting bed comply with AMSMV manufacturer's instructions, NCMA (AMSV), NCMA TEK 20-01, ASTM C1780 and ICC-ES AC51:

1. Concrete Masonry: Verify joints are cut flush and surface is ready to receive mortar scratch coat and setting bed. Verify no bituminous or water repellent coatings exist on masonry surface.

3.2 PREPARATION

A. Dampen masonry surfaces to reduce excessive suction.

3.3 INSTALLATION - SCRATCH COAT

A. Apply mortar scratch coat of 1/2 inch nominal to cover concrete masonry backup in accordance with AMSMW requirements. Scratch surface when somewhat firm. If scratch coat dries before applying setting bed mortar and AMSMV, moisten scratch coat by misting it with water.

3.4 INSTALLATION - AMSMV

A. Install AMSMV with a cementitious mortar setting bed to a scratch coat backing surface, in accordance with AMSMV manufacturer's instructions, NCMA (AMSV), NCMA TEK 20-01, ASTM C1780.

B. Windows, Doors and Wall Openings: Butt AMSMV units to wall opening. See drawings.

1. Install one piece pre-made stone returns at recessed opening conditions.

C. Seal all joints at wall openings, penetrations and where AMSMV units abut any other material with sealant approved for use with AMSMV.

3.5 INSTALLATION - MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

3.6 CONTROL AND EXPANSION JOINTS

A. Form joints as detailed on drawings.

3.7 TOLERANCES

A. Maximum Variation from Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.

E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

3.8 CUTTING AND FITTING

A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.

3.9 CLEANING

A. Remove excess mortar and mortar smears as work progresses.

B. Clean AMSMV in accordance with manufacturer's installation instructions.

C. Clean soiled surfaces with cleaning solution.

3.10 PROTECTION

A. Protect finished work from rain during and for 48 hours following installation.

END OF SECTION 04 73 00

DIVISION 05 - METALS
SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural steel framing members, support members.

B. Base plates, bearing plates and anchors.

C. Surface preparation for priming and touch-up primer.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Non-shrink grout under base plates and bearing plates.

B. Section 05 50 00 - Metal Fabrications: Steel fabrications affecting structural steel work.

C. Section 09 91 13 - Exterior Painting: Priming requirements for exterior and galvanized steel.

D. Section 09 91 23 - Interior Painting: Priming requirements for interior steel.

1.3 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; 2023.

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2022.

C. AISC 341 - Seismic Provisions for Structural Steel Buildings; 2016.

D. AISC 360 - Specification for Structural Steel Buildings; 2022.

E. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2017.

F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

H. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

I. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

J. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.

K. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2019.

L. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2021a.

M. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2021a.

N. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric); 2021a.

O. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2021, with Editorial Revision.

P. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

Q. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2022.

R. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.

S. ASTM E94/E94M - Standard Guide for Radiographic Examination Using Industrial Radiographic Film; 2017.

T. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2019.

U. ASTM E165/E165M - Standard Practice for Liquid Penetrant Testing for General Industry; 2023.

V. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2021.

W. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2019.

X. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series; 2017a.

Y. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.

Z. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2022.

AA. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

BB. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.

CC. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

DD. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2020.

EE. SSPC-PA 1 - Shop, Field, and Maintenance Painting of Steel; 2004.

FF. SSPC-SP 2 - Hand Tool Cleaning; 2018.

GG. SSPC-SP 3 - Power Tool Cleaning; 2018.

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.

2. Connections, Connections not detailed, Splices, and Holes.

a. Indicate type, size, and length of bolts. Distinguish between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

b. Indicate welded connections with AWS A2.4 welding symbols. Distinguish between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

3. Indicate cambers.

4. Include embedment Drawings.

5. Do not reproduce Contract Documents or Project Files to create shop drawings.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

D. Fabricator's Qualification Statement.

E. Product Data: For each type of product. Include Test Reports for the following:

1. Tension-control, high-strength, bolt-nut-washer assemblies.

F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

G. Field quality-control and special inspection reports.

1.6 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN).

B. Fabricate steel fasteners in accordance with RCSC (HSBOLT).

C. Fabricator: Company specializing in performing the work of this section with minimum 5 years of documented experience.

D. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M .

E. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.

F. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.

2. Clean and relubricate bolts and nuts that become dry or rusty before use.

3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 PRODUCTS

2.1 MATERIALS

A. Steel Angles, Plates, and Channels: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Rolled Steel Structural Shapes: ASTM A992/A992M.

D. Steel Shapes, Plates, and where 50 KSI steel is indicated in Drawings: ASTM A572/A572M, Grade 50 (345) high-strength, columbium-vanadium steel.

E. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade C.

F. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain with matching compatible ASTM A563/A563M nuts and ASTM F436/F436M washers.

1. Bolt Grade: Gr. A325 Conventional and Gr F1852 Twist-Off-Type Tension-Control

2. Hardened Washers: ASTM F436/F436M

3. Direct-Tension Indicators: ASTM F959/F959M, Type 325 (Type 8.8), compressible-washer type with plain finish.

G. Unheaded Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563/A563M nuts and ASTM F436/F436M Type 1 washers.

H. Headed Anchor Rods: As per Documents (ASTM F1554, Grade 36 minimum), plain. Provide Hot-dip zinc coating, ASTM A153/A153M , Class C at exterior conditions. Provide matching ASTM A563/A563M heavy-hex carbon-steel nuts and ASTM F436/F436M Type 1 hardened carbon-steel washers.

I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

J. Sliding Bearing Plates: Teflon coated.

2.2 TOUCH-UP PRIMER

A. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

B. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.3 FABRICATION

A. Shop fabricate to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.

1. Identify high-strength structural steel according to ASTM A6/A6M and maintain markings until structural steel has been erected.

2. Mark and match-mark materials for field assembly.

3. Complete structural-steel assemblies, including welding of units, before starting shop- priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M .

C. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Bolt Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces. Do not enlarge holes by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

D. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

E. Fabricate connections for bolt, nut, and washer connectors.

F. Develop required camber for members.

2.4 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened, Pretensioned, or Slip critical as required by the professional engineer responsible for connection design.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.5 FINISH

A. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

B. Prepare structural component surfaces in accordance with SSPC-SP 2 Hand-Tool Cleaning. Remove loose rust and mill scale and spatter, slag or flux deposits.

C. Shop prime structural steel members. Do not prime surfaces that will be galvanized, fireproofed, field welded, high strength bolted, or embedded in concrete or mortar.

D. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123/A123M.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

3. Galvanize all exterior steel members and connectors.

2.6 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts."

C. Welded Connections: Visually inspect all shop-welded connections using one of the following at the testing agency's option:

1. Radiographic testing performed in accordance with ASTM E94/E94M.

2. Ultrasonic testing performed in accordance with ASTM E164.

3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.

4. Magnetic particle inspection performed in accordance with ASTM E709.

D. Prepare test and inspection reports.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete and masonry bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in- place concrete has attained its design compressive strength.

3.3 ERECTION

A. Erect structural steel in compliance with AISC 303 "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360, accurately in locations and to elevations indicated.

B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.

2. Weld plate washers to top of baseplate.

3. Snug-tighten anchor rods after supported members have been positioned and plumbed unless indicated to be pretensioned. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts

C. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members where indicated.

F. Do not use thermal cutting during erection unless approved by Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. High-Strength Bolts: Install high-strength bolts according to RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Do not enlarge bolt holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Do not field cut or alter structural members without approval of Architect.

I. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

J. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.4 TOLERANCES

A. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

3.5 FIELD QUALITY CONTROL

A. Owner shall engage an independent testing agency to perform field quality control tests, as specified in Section 01 40 00 to include the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.

2. Verify weld materials and inspect welds.

3. Verify connection materials and inspect high-strength bolted connections.

B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts."

C. Welded Connections: Visually inspect all field-welded connections in accordance withAWS D1.1/D1.1M and test using one of the following, at the testing agency's option:

1. Radiographic testing performed in accordance with ASTM E94/E94M.

2. Ultrasonic testing performed in accordance with ASTM E164.

3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.

4. Magnetic particle inspection performed in accordance with ASTM E709.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION 05 12 00

DIVISION 05 - METALS
SECTION 05 14 00 - STRUCTURAL ALUMINUM

PART 1 GENERAL

1.1 section includes

A. Structural aluminum framing members.

B. Aluminum base plates, connection plates, and connectors.

1.2 related requirements

A. 03 30 00 - Cast-in-Place Concrete Non-shrink grout under base plates and bearing plates.

B. 05 50 00 - Metal Fabrications Galvanized steel anchor bolts.

C. 05 53 05 - Metal Gratings and Floor Plates

1.3 reference standards

A. ASTM B209/B209M Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

B. ASTM B211/B211M Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire

C. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

D. ASTM B308/B308M Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles

E. ASTM B316/B316M Standard Specification for Aluminum and Aluminum-Alloy Rivet and Cold-Heading Wire and Rods

F. ASTM B429/B429M Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube

G. ASTM F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

H. ASTM F594 Standard Specification for Stainless Steel Nuts

I. AWS A2.4 Standard Symbols for Welding, Brazing, and Nondestructive Examination

J. AWS A5.10/A5.10M Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods

K. AWS D1.2/D1.2M Structural Welding Code - Aluminum

L. SSPC-SP 1 Solvent Cleaning

1.4 DESIGN and fabrication REQUIREMENTS

A. Except as shown or specified otherwise, the Work of this Section shall meet the requirements of the following:

1. Design and Fabrication:

a. "Aluminum Structures: A Guide to their Specifications and Design, Second Edition, 2002", by the Aluminum Association, Incorporated (AAI Specification).

b. "Aluminum Design Manual, 2020", by the Aluminum Association, Incorporated (AAI Specification).

2. Welding: "Structural Welding Code - Aluminum, AWS D1.2/D1.2M", by the American Welding Society (AWS Code).

1.5 submittals

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Submit shop drawings for structural aluminum. Shop drawings shall be standard 11 by 17 inch size sheets. The fabricator's name and address shall be indicated in the title block on each drawing.

1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.

2. Include anchor bolt and base plate and other embedment plans and details.

3. Connections, Connections not detailed, Splices, and Holes:

a. Indicate type, size, and length of bolts. Distinguish between shop and field bolts. Identify special bolted connections.

b. Indicate shop and field welds by standard AWS welding symbols in accordance withAWS A2.4. Show size, length, and type of each weld.

Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

4. When shop drawings are marked "Approved as Noted", promptly resubmit copies of corrected shop drawings for formal approval and record.

5. Do not reproduce Contract Documents or Project Files to create shop drawings.

C. Quality Control Submittals:

1. Certificates: Submit evidence of aluminum material compliance with this Specification. Evidence shall consist of certification of source of material, copies of purchase orders, and copies of the manufacturer's certification of inspection and test results.

2. Fabricator's and Erector's Qualifications Data: Name and experience of fabricator and erector.

3. Welding Procedure Specifications: Submit procedure specifications for each joint to be welded.

1.6 QUALITY ASSURANCE

A. Fabricator's and Erector's Qualifications: The fabricator and erector shall be experienced in structural aluminum work and shall be subject to the approval of the Owner.

B. Inspection: Shop and field quality assurance inspection may be made by the Owner. If quality assurance inspection is made by the Owner, it shall not relieve the fabricator and erector of responsibility for their own quality control programs.

C. Welding: All welding procedures, welders, welding operators and tackers shall be qualified in accordance with the AWS Code.

D. Alloy Identification: Mill mark aluminum material with alloy and heat treatment designation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery of anchor bolts and other anchorage devices to be built into other construction to avoid delay.

B. Deliver prefinished items with protective covering, and store and handle such items in a manner that will not cause damage to the finish.

C. Upon delivery to the site, promptly cover and protect aluminum items.

D. Store shop paint in accordance with paint manufacturer's printed instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Aluminum: 6061-T6 alloy, conforming to the following specifications:

1. Sheet and Plate: ASTM B209/B209M.

2. Rolled Bars and Rods: ASTM B211/B211M.

3. Extruded Bars, Rods, Shapes, and Tubes: ASTM B221.

4. Rolled or Extruded Structural Shapes: ASTM B308/B308M.

5. Extruded Structural Pipe and Tube: ASTM B429/B429M.

B. Stainless Steel Fasteners:

1. Bolts: 316 alloy, ASTM F593.

2. Threaded Rods: 316 alloy, ASTM F593.

a. Nuts: 316 alloy, ASTM F594.

3. Plain Washers: 316 alloy, FS FF-W-92, round, general assembly grade, Class B.

4. Lock Washers: 316 alloy, FS FF-W-84, helical spring type, Class C, Style 2.

C. Weld Filler Metal: ER5356 filler metal complying with AWS A5.10/A5.10M.

D. Shielding Gas: Argon.

2.2 FABRICATION

A. Do not commence fabrication until the fabricator has been approved and the fabrication schedule has been coordinated with the designated Quality Assurance inspection agency.

1. Give the Owner's Representative one-week advance notice of the commencement of fabrication.

B. Progress shop fabrication from "Approved" or "Approved as Noted" detail drawings only.

1. When detail drawings are "Approved as Noted", progress fabrication in strict accordance with notes thereon.

C. Make provisions for connections of other Work, including all cutting and punching of structural members where required by the Drawings, or for which information is furnished prior to approval of the shop drawings.

D. Cleaning Aluminum: Thoroughly clean structural aluminum. Remove oil, grease, and similar contaminants in accordance with SSPC-SP 1 "Solvent Cleaning".

1. Etch aluminum surfaces if so recommended by the manufacturer of the shop paint.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine surfaces to receive aluminum framing for defects that will adversely affect the execution and quality of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Isolate aluminum surfaces to be permanently fastened in contact with ferrous metal surfaces, concrete, or masonry by coating the aluminum surfaces with a 150 mil wet film coat of bituminous mastic, prior to installation or provide rubber grommets.

3.3 ERECTION

A. Whenever piles of material, erection equipment or other loads are carried during erection, make proper provision to compensate for stresses resulting from such loads. Install temporary bracing as necessary to take care of all loads to which the structure may be subjected, including equipment and the operation of same. Such bracing shall be left in place as long as may be required for safety.

1. Erect structural aluminum framing plumb, level, and in true alignment.

B. As erection progresses, temporarily connect the Work to take care of dead load, and erection stresses.

C. Do not perform permanent bolting or welding until as much of the structure as will be stiffened thereby has been properly aligned, and approval has been given by the Owner's Representative.

D. Do not use gas or air carbon-arc cutting to cut or enlarge bolt holes.

E. Do not make corrections or alterations to fabricated aluminum without prior written approval by the Owner's Representative.

1. Do not cut or abrade finishes which cannot be completely restored in the field. Return such items to the shop for required alterations and complete refinishing.

F. Tolerances: Individual pieces will be considered plumb, level, and aligned if the error does not exceed 1:500.

3.4 CLEANING

A. Remove protective coverings and clean exposed surfaces.

END OF SECTION 05 14 00

DIVISION 05 - METALS
SECTION 05 50 00 - METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shop fabricated steel items, including:

1. Metal bollards.

2. Loose steel lintels.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete and non-shrink grout.

B. Section 033000 - Cast-in-Place Concrete: Concrete for grouting of bollards.

C. Section 05 12 00 - STRUCTURAL STEEL FRAMING: Structural steel column anchor bolts.

D. Section 05 12 00 - STRUCTURAL STEEL FRAMING: Steel embedded anchors and bearing plates in masonry.

E. Section 09 91 23 - Interior Painting: Field priming and paint finish.

F. Section 09 9600 - High Performance Coatings: Field priming and paint finish.

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

E. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

G. SSPC-PA 1 - Shop, Field, and Maintenance Painting of Steel; 2004.

H. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

I. SSPC-SP 2 - Hand Tool Cleaning; 2018.

J. SSPC-SP 3 - Power Tool Cleaning; 2018.

K. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MATERIALS - STEEL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

2.3 MATERIALS - PAINT

A. Shop and Touch-up Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20, Type I - Inorganic and compatible with paints specified to be used over it.

2.4 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Fabricate items with joints tightly fitted and secured.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Locate joints where least conspicuous. Ease exposed edges to small uniform radius. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.5 FABRICATED ITEMS

A. Bollards: Schedule 40 Steel pipe, concrete filled, crowned cap, as detailed; galvanized finish.

B. Ledge Angles and Plates Not Attached to Structural Framing: For support of masonry; galvanized finish unless otherwise indicated.

C. Lintels: As detailed; prime paint finish unless otherwise indicated.

1. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

2. Galvanize loose steel lintels located in exterior walls.

2.6 PREFABRICATED LADDERS

A. Prefabricated Ladder: Welded metal unit complying with ANSI A14.3, except for elevator pit ladders which shall comply with ASME A17.1/CSA B44; factory fabricated to greatest degree practical and in the largest components possible.

1. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.

a. Space siderails 18 inches apart unless otherwise indicated.

b. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.

c. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 1/2 inch (12 mm) in least dimension.

d. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.

e. Galvanize exterior ladders, including brackets.

2.7 FINISHES - STEEL

A. Prime paint steel items.

1. Exceptions: Galvanize items to be embedded in masonry, in exterior walls, outside the building envelope, or connections of galvanized items.

2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, or items to be covered with sprayed fireproofing.

B. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6, "Commercial Blast Cleaning."

2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6, "Commercial Blast Cleaning."

3. Other Items: SSPC-SP 3 , "Power Tool Cleaning."

C. After assembly, clean surfaces of rust, scale, grease, and foreign matter prior to finishing. Remove tool and die marks and stretch lines, and blend into surrounding surface.

D. Prime Painting: One coat. Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

E. Galvanizing of Structural Steel Members: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates, temporary bracing, or anchors in formwork to the appropriate entities for steel items required to be embedded in masonry.

C. Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

3.3 INSTALLATION

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Provide for erection loads for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.4 INSTALLING METAL BOLLARDS

A. Anchor bollards in concrete in formed or core-drilled holes not less than 8 inches deep and 3/4 inch larger than OD of bollard. Fill annular space around bollard solidly with nonshrink grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.

B. Fill bollards solidly with concrete, mounding top surface to shed water.

END OF SECTION 05 50 00

DIVISION 05 - METALS
SECTION 05 53 05 - METAL GRATINGS AND FLOOR PLATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Formed metal floor, mezzanine, and stair tread gratings.

B. Flat surface floor and stair tread plating.

C. Perimeter closure.

1.2 RELATED REQUIREMENTS

A. Section 05 51 00 - Metal Stairs: Framing for grating and stair treads.

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

E. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates; 2015.

F. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

H. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

J. NAAMM MBG 531 - Metal Bar Grating Manual; 2009.

K. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

L. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

M. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate details of component supports, openings, perimeter construction details, and tolerances.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.

1.5 QUALITY ASSURANCE

A. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months in accordance with AWS D1.1/D1.1M.

PART 2 PRODUCTS

2.1 MATERIALS

A. Steel Floor Plate: ASTM A786/A786M; manufacturer's standard pattern.

B. Steel For Welding or Riveting: ASTM A36/A36M unfinished, of shapes indicated.

C. Steel Sheet for Lock Forming: Hot-dipped galvanized, ASTM A653/A653M, FS Type B, with G90/Z275 coating.

D. Steel Framing: ASTM A36/A36M shapes, unfinished.

E. Aluminum For Lock Forming: ASTM B211/B211M bars, shapes as indicated.

F. Cross Bars: ASTM B211/B211M solid bars.

G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2 ACCESSORIES

A. Fasteners and Saddle Clips: Galvanized steel:

B. Perimeter Closure: Of same material as grating.

2.3 FABRICATION

A. Grating Type: NAAMM MBG 531, Pressure Locked Type.

B. Fabricate support framing for openings.

C. Top Surface: Serrated.

D. Bearing Bar: __ by __ inch size, spaced ____ inches on center.

E. Cross Bar: __ by __ inch size, spaced ____ inches on center.

2.4 FINISHES

A. Prepare surfaces to be primed in accordance with SSPC-SP 2.

B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

C. Do not prime surfaces in direct contact with concrete or where field welding is required.

D. Prime paint items with one coat.

E. Galvanizing for Steel Shapes: ASTM A123/A123M.

F. Galvanizing for Steel Hardware: ASTM A153/A153M.

G. Aluminum: Mill finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated on drawings.

B. Verify that opening sizes and dimensional tolerances are acceptable.

C. Verify that supports are correctly positioned.

3.2 INSTALLATION

A. Install components in accordance with manufacturer's instructions.

B. Place frames in correct position, plumb and level.

C. Mechanically cut galvanized finish surfaces. Do not flame cut.

D. Anchor by welding.

E. Set perimeter closure flush with top of grating and surrounding construction.

F. Secure to prevent movement.

3.3 TOLERANCES

A. Comply with NAAMM MBG 531.

END OF SECTION 05 53 05

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural dimension lumber framing.

B. Nonstructural dimension lumber framing.

C. Rough opening framing for doors, windows, and roof openings.

D. Preservative treated wood materials.

E. Fire retardant treated wood materials.

F. Miscellaneous framing.

G. Communications and electrical room mounting boards.

H. Concealed wood blocking, nailers, and supports.

I. Roof sheathing.

J. Exterior wall sheathing.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Setting anchors in concrete.

B. Section 04 2000 - Unit Masonry: Masonry wall construction.

C. Section 06 17 53 - Shop-Fabricated Wood Trusses.

D. Section 06 4100 - Architectural Wood Casework: Base and wall cabinets.

E. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

F. Section 07 4113.16 - Standing Seam Metal Roof Panels: Standing seam metal roof.

G. Section 07 4213.53 - Metal Soffit Panels: Metal soffit.

H. Section 07 4646 - Fiber Cement Siding: Exterior wall finish.

I. Section 07 5423 - Thermoplastic Polyolefin (TPO) Membrane Roofing - Carlisle: TPO membrane.

J. Section 07 7253 - Thermoplastic Polyolefin (TPO) Membrane Roofing - Carlisle: Snow guards.

K. Section 08 4113 - Aluminum Framed Entrances and Storefronts: Aluminum windows

L. Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard.

M. Section 099123 - Interior Painting: Paint finish for communication and electrical room mounting boards.

1.3 REFERENCE STANDARDS

A. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

C. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2018, with Errata (2019).

D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2023.

E. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. ICC (IECC) - International Energy Conservation Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. PS 1 - Structural Plywood; 2019.

H. PS 2 - Performance Standard for Wood Structural Panels; 2018.

I. PS 20 - American Softwood Lumber Standard; 2021.

J. SPIB (GR) - Standard Grading Rules; 2021.

1.4 SUBMITTALS

A. Product Data: Provide technical data on wood preservative materials.

B. Shop Drawings for off-site shear wall panel construction:

1. Provide plans showing panel layout and panel type, elevations of each wall panel type, and details.

2. Indicate panel lengths, height, stud size and spacing, sheathing type, thickness and grade, and nailing pattern.

3. Provide details of panel to panel connection indicating shear wall load transfer continuity.

C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. Species: Douglas Fir-Larch, unless otherwise indicated.

2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.

3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.2 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

C. Stud Framing (2 by 2 through 2 by 6, as indicated):

1. Grade: No. 2.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:

1. Lumber: S4S, No. 2 or Standard Grade.

2. Boards: Standard or No. 3.

2.3 CONSTRUCTION PANELS

A. Roof Sheathing: APA Rated; PS 1 or PS 2.

1. Panel Type: Plywood or Oriented Strand Board.

2. Grade: Structural 1 Sheathing.

3. Bond Classification: C-C, Exterior Exposure.

4. Performance Category: See drawings.

5. Span Rating: 24/0.

6. Edges: Square.

B. Wall Sheathing: Plywood PS 1 or OSB PS 2 type.

1. Bond Classification: C-C, Exterior Exposure.

2. Grade: Structural I Sheathing.

3. Span Rating: 24.

4. Performance Category: 9/16 PERF CAT minimum or as otherwise shown on the drawings.

5. Edge Profile: Square edge.

6. Thickness: See drawings.

2.4 ACCESSORIES

A. Fasteners and Anchors:

1. Metal and Finish: Stainless steel for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

B. Sill Gasket on Top of Foundation Wall below Wood Base Plate: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.

C. Roof Sheathing Panel Clips: Manufacturer's standard G-90 galvanized, minimum 20 gage roof sheathing panel clips.

1. Size: Match to roof sheathing panel thickness.

2. Products:

   a. Simpson Strong-Tie; PSCA Panel Sheathing Clip: www.strongtie.com/#sle.

   b. Substitutions: See Section 01 6000 - Product Requirements.

2.5 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:

1. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.

   a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

   b. Treat rough carpentry items as indicated .

   c. Communications and Electrical Room Mounting Boards: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated, or, if not indicated, not less than 3/4-inch nominal thickness.

   d. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:

1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.

a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

b. Treat lumber in contact with masonry or concrete.

c. Treat lumber in other locations as indicated.

2. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.

a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.

b. Treat plywood in contact with masonry or concrete.

c. Treat plywood in other locations as indicated.

PART 3 EXECUTION

3.1 PREPARATION

A. Install sill gasket under sill plate of framed walls bearing on concrete foundations; puncture gasket cleanly to fit tightly around any protruding anchor bolts. Lap sill gaskets as recommended by manufacturer.

B. Coordinate installation of rough carpentry members specified in other sections.

3.2 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.3 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.

E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.

F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.4 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.

C. Install wood framing at opening(s) in wood roof sheathing as required. Coordinate with Section 06 1753.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Provide the following specific nonstructural framing and blocking:

1. Cabinets and shelf supports.

2. Wall brackets.

3. Handrails.

4. Grab bars.

5. Towel and bath accessories.

6. Wall-mounted door stops.

7. Chalkboards and marker boards.

8. Wall paneling and trim.

9. Joints of rigid wall coverings that occur between studs.

3.5 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing/ Plywood: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.

1. At long edges use sheathing panel clips where joints occur between roof framing members.

a. Provide number of clips recommended by clip manufacturer for spacing between trusses and sheathing thickness but no fewer than one clip. Clip shall serve to provide minimum recommended spacing between each sheathing panel.

2. Screw panels to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws.

C. Communications and Electrical Room Mounting Boards: Secure mounting boardswith screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.

1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.

2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.

3. Coordinate location(s) with utility contractor requiring backing panel(s). Install fire-retardant-treated plywood backing panels with classification marking(s) of testing agency exposed to view.

4. Install adjacent boards without gaps.

3.6 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.7 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.8 CLEANING

A. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

B. Prevent sawdust and wood shavings from entering the storm or sanitary drainage system.

END OF SECTION 06 10 00

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
SECTION 06 17 53 - SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shop-fabricated wood roof trusses.

B. Truss bridging.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Installation requirements for miscellaneous framing.

B. Section 06 10 00 - Rough Carpentry: Material requirements for blocking, bridging, plates, and miscellaneous framing.

C. Section 06 100 - Rough Carpentry: Roof sheathing.

1.3 REFERENCE STANDARDS

A. ANSI/TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction; 2014.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

D. ASTM F1667/F1667M - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples; 2021a.

E. PS 20 - American Softwood Lumber Standard; 2021.

F. SBCA (BCSI) - Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses; 2018 (Updated 2020).

G. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses; 1989.

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.

B. Shop Drawings: Provide shop drawings and delegated design analysis data signed and sealed by a Structural Engineer licensed in the State in which the project is located.

1. Indicate compliance with performance requirements and design criteria.

2. Indicate sizes, stress grades, and species of lumber.

3. Show truss configuration, size, spacing, cambers, location and pitch for each truss type required.

4. Indiate size, type, material, finish, design values, orientation, and location of metal plate connectors.

5. Show splice details and bearing details

6. Show fabrication and installation details for trusses including framed openings, bearing and anchor details, and bridging and bracing.

a. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.

7. Include identification of engineering software used for design.

8. Submit design calculations.

C. Informational Submittals:

1. Material Certificates: For dimension lumber specified to comply with minimum specific gravity. Indicate species and grade selected for each use and specific gravity.

2. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss-fabricating firm.

1.5 QUALITY ASSURANCE

A. Designer Qualifications: Perform design by or under direct supervision of a Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

C. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1. Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle trusses in accordance with SBCA (BCSI).

B. Store trusses in vertical position resting on bearing ends.

C. Protect trusses from weather by covering with waterproof sheeting, securely anchored.

D. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.1 TRUSSES

A. Wood Trusses: Design in accordance with ANSI/TPI 1 and to achieve specified design requirements indicated.

1. Design and fabricate temporary bracing in accordance with TPI DSB-89.

2. Connectors: Steel plate.

3. Design Loads: As indicated.

4. Roof Deflection: 1/240, maximum total load, 1/360 maximum live load.

B. Wood Truss Fabrication:

1. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

2. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in ANSI/TPI 1. Position members to produce design camber indicated.

3. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

2.2 MATERIALS

A. Lumber:

1. DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

a. Factory mark each piece of lumber with grade stamp of grading agency.

b. Provide dressed lumber, S4S.

c. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

2. Moisture Content: Between 7 and 9 percent.

3. Minimum Chord Size for Roof Trusses:

a. Building 1; O/M: 2 x 6 inches nominal for both top and bottom chords.

b. Building 2; WTP: 2 x 4 inches nominal for both top and bottom chords.

4. Lumber fabricated from old growth timber is not permitted.

B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G60/Z180 coating; die stamped with integral teeth; thickness not less than 0.036 inch thick.

1. For use at interior locations unless otherwise indicated.

C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

D. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in 06 10 00 - Rough Carpentry.

2.3 ACCESSORIES

A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, 19 percent maximum and 7 percent minimum moisture content.

B. Fasteners: Hot-dip galvanized steel, type to suit application.

1. Nails and staples to meet ASTM F1667/F1667M.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that supports and openings are ready to receive trusses.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

3.2 PREPARATION

A. Coordinate placement of bearing items.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

3.3 ERECTION

A. Install trusses in accordance with manufacturer's instructions, SBCA (BCSI); maintain a copy of applicable documents on site until installation is complete.

1. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

B. Set members level and plumb, in correct position, spaced as indicated. Adjust and align trusses in location. Securely fasten to supporting construction.

C. Anchor trusses securely at bearing points; use metal truss tie-downs or truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.

D. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.

E. Do not field-cut, drill, notch or alter structural members without approval of Architect.

F. Install permanent bridging and bracing.

G. Frame openings between trusses with lumber in accordance with Section 06 10 00.

3.4 TOLERANCES

A. Framing Members: 1/2 inch maximum, from true position.

3.5 repairs and protection

A. Replace wood trusses that are damaged or do not comply with requirements.

1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified structural engineer responsible for truss design, when approved by the Architect.

B. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

C. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

D. Repair damaged galvanized coatings on exposed surfaces according to ASTM A780/A780M and manufacturer's written instructions.

END OF SECTION 06 17 53

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
SECTION 06 41 00 - ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Hardware.

C. Preparation for installing utilities.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 12 36 00 - Countertops.

1.3 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).

C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.

D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.

2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

3. Include certification program label.

B. Product Data: Provide data for hardware accessories.

C. Samples: Submit actual samples of architectural cabinet construction, minimum 8 inches square, illustrating proposed cabinet and shelf unit substrate and finish.

D. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, locksets, and surface materials, demonstrating hardware design, quality, and finish.

E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.8 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.1 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.

B. Plastic Laminate Faced Cabinets: Custom grade.

C. Cabinets:

1. Finish - Exposed Exterior Surfaces: Decorative laminate.

2. Finish - Exposed Interior Surfaces: Decorative laminate.

3. Finish - Semi-Exposed Surfaces: Thermoset decorative panels.

a. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.

b. For semi-exposed backs of panels with exposed plastic laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3 Grade VGS.

4. Door and Drawer Front Edge Profiles: Square edge with thin applied band.

5. Casework Construction Type: Type A - Frameless.

6. Interface Style for Cabinet and Door: Style 1 - Overlay; flush overlay.

7. Layout for Cabinet and Door Fronts: Flush panel.

a. Custom Grade: Doors, drawer fronts and false fronts wood grain to run and match vertically within each cabinet unit.

8. Adjustable Shelf Loading: 50 lbs. per sq. ft.

9. Cabinet Style: Flush overlay.

10. Cabinet Doors and Drawer Fronts: Flush style.

11. Drawer Side Construction: Glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints. Metal drawer system sides also acceptable..

12. Drawer Construction Technique: Dovetail joints.

2.2 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

B. Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood moisture content: 5 to 10 percent.

C. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Particleboard: ANSI A208.1, Grade M-2.

2. Softwood Plywood: DOC PS 1, medium-density overlay.

3. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermallyl fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGJL, for test methods 3.3, 3.4, 3.6, 3.8 and 3.10.

2.3 LAMINATE MATERIALS

A. Manufacturers:

1. Basis of Design: Wilsonart; www.wilsonart.com.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. Provide specific types as follows:

1. Edges: PVC edge banding, 1mm thick PVC on Cabinet, 3mm PVC on all Doors and Drawer fronts, match laminate in color, pattern and finish.

2.4 COUNTERTOPS

A. Countertops are specified in Section 12 36 00.

2.5 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

E. Grommets: Standard plastic grommets for cut-outs, in color to be selected by Architect from manufacturer's full range.

1. Locate grommets per Owner. Coordinate prior to order and installation.

2.6 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, satin chrome finish, for nominal 1 inch spacing adjustments.

C. Drawer and Door Pulls: "U" shaped wire pull, steel with satin finish, 4 inch centers.

D. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.

E. Catches: Magnetic.

F. Drawer Slides:

1. Type: Full extension.

2. Static Load Capacity: Heavy Duty grade.

3. Mounting: Side mounted.

G. Hinges: European style concealed self-closing type, steel with satin finish.

2.7 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.

E. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Seal cut edges.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

C. Use fixture attachments in concealed locations for wall mounted components.

D. Use concealed joint fasteners to align and secure adjoining cabinet units.

E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

F. Secure cabinets to floor using appropriate angles and anchorages.

3.3 ADJUSTING

A. Test installed work for rigidity and ability to support loads.

B. Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION 06 41 00

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
SECTION 06 64 00 - PLASTIC PANELING

PART 1 GENERAL

1.1 Section Includes

A. Prefinished polyester glass reinforced plastic panels directly attached to wall substrate.

B. Composite prefinished polyester glass reinforced plastic panels laminated to plywood backer sheets.

C. Extruded PVC trim.

1.2 Related Requirements

A. Section 061000 - Rough Carpentry: Wood stud wall framing and miscellaneous wood blocking.

B. Section 061753 - Shop-Fabricated Wood Trusses: Wood roof trusses and miscellaneous wood blocking.

C. Section 072100 - Thermal Insulation: Glass fiber batt/blanket thermal insulation and vapor barrier.

D. Section 07 92 00 - Joint Sealants.

E. Section 081113 - Hollow Metal Doors and Frames: Hollow metal door frames.

F. Section 092116 - Gypsum Board Assemblies: Gypsum wallboard and miscellaneous metal furring.

G. Section 096500 - Resilient Flooring: Vinyl base.

1.3 Reference Standards

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

1.4 Administrative Requirements

A. Coordination: Coordinate plastic panel installation requirements with layout of stud framing and furring supporting members.

B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication: show recorded meausrements on shop drawings. Coordinate field

measurements and fabrication schedule with the construction progress to avoid construction delays.

1. Wall, ceilings, floors and openings shall be level, plumb, straight, in-line and square. Where conditions do not comply with requiremnts for proper installation of plastic paneling, advise Contractor in writing.

    a. Beginning of work shall result in Installer accepting non-complying conditions.

1.5 Submittals

A. Product Data: For each plastic panel and trim type.

B. Shop Drawings:

1. For each wall plastic paneling layout, indicate:

    a. Elevations: Dimensioned locations of panels and penetrations. Include field measurements indicating extents of paneling.

        1) Show anchorage and location(s) for supporting wood substructure, wood and metal furring and blocking members.

    b. Drawing Scale: 1/4 inch to 1 foot, minimum.

2. For each ceiling plastic paneling layout, indicate:

    a. Reflected Ceiling Plans: Dimensioned locations of plastic panels and penetrations. Include field measurements indicating extents of paneling.

        1) Show anchorage and location(s) for supporting wood substructure, wood and metal furring and blocking members.

    b. Drawing Scale: 1/4 inch to 1 foot, minimum.

3. Details: Include plastic panel-to-trim connections.

    a. Show anchorege and location(s) for supporting wood substructure, wood and metal furring and blocking members.

    b. Drawing Scale: 1-1/2 inches to 1 foot, minimum.

C. Samples: For each plastic wall and ceiling panel type, two samples, 6 inches by 6 inches in size, indicating specified color and texture.

1. Samples: For each trim type, two samples, 4 inches in length, indicating specified color and texture.

D. Manufacturer's Installation Instructions: For each plastic panel type and associated trim, provide manufacturer's written installation instructions.

E. Maintenance Data: Plastic panel maintenance and cleaning recommendations.

F. Executed warranty.

1.6 Delivery, Storage, and Handling

A. Deliver products to site in manufacturer's original, unopened packaging, with labels clearly identifying product name and manufacturer.

B. Store products in clean, dry, interior areas in accordance with manufacturer's written instructions.

C. Store plastic panels and trim flat as recommended by plastic paneling manufacturer.

1.7 Field Conditions

A. Ambient Field-Cutting Conditions: Before field-cutting plastic panels in temperatures below 40 degrees F, warm space to 60 degrees F minimum. Maintain temperature for a minimum 24 hours before, during, and after field-cutting.

B. Ambient Conditions for Installation: When ambient temperatures are below 40 degrees F, warm space to 60 degrees F minimum. Maintain temperature for a minimum 24 hours before, during, and after installation.

C. Ambient Conditions for Installation: When ambient temperatures are above 70 degrees F, cool space to 60 degrees F. Maintain temperature for a minimum 24 hours before, during, and after installation.

1.8 Warranty

A. Manufacturer Warranty: Provide 10-year manufacturer's warranty for products free from manufacturing defects. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 Products:

A. FRP-1:

1. Nudo, Standard RFP: www.nudo.com/#sle.

B. FRP-2:

1. Marlite Symmetric SmartSeam FRP Panels with Sani-coat Sealer: www.marlite.com/#sle.

C. FRP-3:

1. Nudo, Nufiber Laminated Panels F3P500: www.nudo.com/#sle.

D. FRP-4:

1. Nudo, Nufiber Laminated Panels F3P500: www.nudo.com/#sle.

2.2 Plastic Paneling: General:

A. Material: 100 percent virgin PVC (polyvinyl chloride), exterior grade.

B. Surface Burning Requirements, Interior Use: Flame spread index of 25 or less and smoke-development index of 450 or less; Class C classification when tested in accordance with ASTM E84.

C. Plastic Panel Thickness: 0.090 inch nominal unless noted otherwise.

2.3 FRP-1: Standard FRP:

A. Color(s): See drawings.

B. Finish: See drawings.

C. Texture: See drawings.

2.4 FRP-2: Subway Tile Pattern FRP:

A. Color(s): See drawings.

B. Finish: See drawings.

C. Texture: See drawings.

2.5 FRP-3: Composite Plastic Wall Panels:

A. Factory laminated substrate: Manufacturer's standard 1/2 inch nominal thickness fir exterior grade plywood.

B. Color(s): See drawings.

C. Finish: See drawings.

D. Texture: See drawings.

2.6 FRP-4: Composite Plastic Ceiling Panels:

A. Factory laminated substrate: Manufacturer's standard 1/2 inch nominal thickness fir exterior grade plywood.

B. Color(s): See drawings.

C. Finish: See drawings.

D. Texture: See drawings,

2.7 Accessories

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of plastic panels. Provide division bars, inside corners, outside corners, edges and caps as needed to conceal edges and allow for plastic panel expansion and contraction.

1. Color(s): Match plastic panels.

B. Threaded Fasteners: Type and size as recommended by plastic paneling manufacturer for substrate, application, and corrosion risk.

C. Adhesives: Type recommended by panel manufacturer for application; not containing formaldehyde or volatile organic compounds.

D. Joint Sealants: Type(s) recommended by plastic panel manufacturer for application.

1. Color(s): As selected by Architect from manufacturer's standard color selection. Unless otherwise indicated/selected, match color of plastic panel.

PART 3 EXECUTION

3.1 Examination

A. Verify field measurements are as indicated on shop drawings.

B. Verify substrates are properly prepared to receive plastic paneling.

C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Verify mechanical, electrical, and other building components affecting work of this section are placed and ready to receive work of this section.

3.2 Preparation

A. Surface Preparation: Clean substrate surfaces prior to installing plastic paneling.

B. Wall surfaces shall be dry and free from dirt, dust, grease and any other contaminates. Remove high spots and fill low areas with material acceptable to plastic panel manufacturer.

3.3 Installation - General

A. Maintain manufacturer recommended gap tolerances between plastic panels and adjacent abutments.

B. Field-cut panels in accordance with plastic panel manufacturer's written instructions. Make straight and square cuts; do not damage plastic panels.

3.4 Installation - Plastic Wall and Ceiling Panels

A. See Section 061000 - Rough Carpentry for installation of wood support framing for plastic wall paneling attachment.

1. Walls shown or scheduled to receive plastic paneling shall be flat and even within specified tolerance(s).

2. Where installation is by use of adhesive, previously painted and/or primed wall surfaces shall be prepared to adhesive manufacturer's requirements for proper adhesion.

3. Install interlocking seamed plastic panels as recommended by plastic panel manufacturer's written instructions and approved shop drawings.

B. Coordinate installation of wood and metal subframing with shop-fabricated wood trusses, bridging and accessories. Coordinate installation of wood and metal subframing with glass fiber batt/blanket thermal insulation specified in Section 072100 - Thermal Insulation.

C. See Section 09 22 16 - Gypsum Board Assemblies for installation of gypsum wallboard and metal support framing for composite plastic ceiling paneling attachment.

1. Slide composite plastic panel behind hollow metal frame wallboard return as required for gypsum wallboard. Provide hollow metal frame throat opening on all

three sides (both jambs and head and both faces where composite plastic paneling occurs on wall surface of adjacent space) to accommodate the composite plastic panel thickness(es).

2. Install plastic paneling directly to gypsum wallboard as recommended by plastic panel manufacturer.

D. Install panels and trim in accordance with plastic panel manufacturer's written instructions and approved shop drawings.

E. Vertically Installed Plastic Wall Panel: Install plastic wall panels plumb within specified tolerances.

F. Plastic Ceiling Panel Installation: Install panels level within specified tolerances.

G. Apply sealant between panels and trim in accordance with plastic panel manufacturer's written instructions.

3.5 Tolerances

A. Maximum Variation from True Position: 1/8 inch in 10 feet or as otherwise specified by plastic panel manufacturer.

B. Maximum Variation from Plumb: 1/8 inch in 10 feet or as otherwise specified by plastic panel manufacturer.

C. Maximum Variation from Level: 1/8 inch in 10 feet or as otherwise specified by plastic panel manufacturer.

3.6 Cleaning

A. Clean exposed surfaces of plastic panels and trim in accordance with manufacturer's written instructions.

3.7 Protection

A. Protect installed plastic paneling from subsequent construction operations.

END OF SECTION 06 64 00

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
SECTION 07 11 13 - BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.

B. Material Certificates: For each product, signed by manufacturers.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.4 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 PRODUCTS

2.1 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Basis-Of-Design: W. R. Meadows, Inc., “Sealmastic Emulsion”, or approved equal.

B. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.

C. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.2 MISCELLANEOUS MATERIALS

A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.

B. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

C. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

D. Patching Compound: Epoxy or latex-modified repair mortar of type recommended by dampproofing manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.

1. Proceed with dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

2. Test for surface moisture according to ASTM D 4263.

B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

C. Apply patching compound for filling and patching tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.

3.3 APPLICATION, GENERAL

A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.

1. Apply additional coats if recommended by manufacturer or if required to achieve coverages indicated.

2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.

B. Apply dampproofing to provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls.

1. Lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.

2. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe, and lap dampproofing at least 1/4 inch onto shelf angles supporting veneer.

C. Apply embedded reinforcing fabric at all inside/outside corners and where the cmu wall meets the concrete foundation, as recommended by the manufacturer.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one brush or spray coat at not less than 1 gal./50 sq. ft. (0.8 L/sq. m).

3.5 CLEANING

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 07 11 13

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
SECTION 07 19 00 - WATER REPELLENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes penetrating water-repellent coatings for the following surfaces:

1. Smooth-Face and Split-Face Concrete Unit Masonry (unpainted and unglazed) including cast stone trim.

2. Cast-in-Place Concrete (exposed floor surfaces)

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for curing compounds, curing and sealing compounds, and penetrating liquid floor treatments.

2. Division 04 Section "Unit Masonry" for integral water-repellent admixture for unit masonry assemblies and mortar; sealer for ground-faced unit masonry.

3. Division 07 Section "Joint Sealants."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Include manufacturer's printed statement of VOC content.

2. Include manufacturer's MSDS and Technical Data sheets.

B. Samples: For each type and color of water repellent and substrate indicated, 12 by 12 inches in size, with specified water-repellent treatment applied to half of each Sample.

C. Manufacturer Certificates: Signed by manufacturers certifying that water repellents comply with requirements.

D. Qualification Data: For Installer.

E. Preconstruction Testing Reports: For water-repellent-treated substrates.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for assemblies.

G. Warranty: Warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An applicator having at least five years prior successful experience with the use and application of the specified water repellent on vertical concrete block surfaces. Submit list of projects including address, client contact/phone number for each project.

B. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.5 PROJECT CONDITIONS

A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:

1. Refer to manufacturer’s Technical Bulletin for the recommended temperature of surfaces to be sealed and ambient conditions during application and drying.

2. Concrete surfaces and mortar have cured for more than 28 days.

3. Concrete or concrete masonry walls shall be clean, dry, open capillary, structurally sound, free of curing or form release compounds and other contaminants that will prevent the proper penetration of product.

4. Masonry walls are not treated prior to 30 days after building close-in.

5. Rain or snow is not predicted within 24 hours.

6. Application proceeds more than 24 hours after surfaces have been wet.

7. Do not apply when the substrate is frozen, or if freezing temperatures are imminent.

8. Do not apply when windy conditions occur that may cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

9. Refer to manufacturer’s Technical Bulletin for the recommended joint and crack preparation. Complete sealant work prior to start of water repellent application.

10. The applicator shall provide suitable coverings to protect his own work, the work of others, and all adjacent surfaces/objects. Protect finished equipment and adjacent surfaces not to be sealed. Close off drains.

11. Protect surfaces to be sealed from contamination between coats.

12. Protect sealed surfaces during drying from traffic, damage and contamination.

1.6 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer and Applicator agree(s) to repair or replace materials that fail to maintain water repellency specified in Part 1 "Performance Requirements" Article within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PENETRATING WATER REPELLENTS

A. Concrete Masonry Units: Silane, Penetrating Water Repellent: Clear, monomeric compound containing 40 percent or more solids of alkyltrialkoxysilanes; with alcohol, mineral spirits, water, or other proprietary solvent carrier; and with 5 lb/gal. (600 g/L) or less of VOCs.

1. Basis-of Design: Euclid Chemical Co.; Baracade Silane 40 IPA.

2. Manufacturers/Products: Subject to compliance with requirements, provide products by one of the following:

a. Anti-Hydro International, Inc.; Aridox 20M.

b. Hydrozo, a division of ChemRex; Silane 40.

c. Sonneborn Building Products, a division of ChemRex; Penetrating Sealer 40.

3. Color: None; colorless, non-staining, non-yellowing.

4. Number of Coats: Two.

B. Cast-in-Place Concrete Floors: Penetrating 100% active silane sealer; inhibits water and chloride ion penetration.

1. Basis-of-Design: W.R. Meadows; Pentreat 244-100.

2. Color: None; colorless

3. Number of Coats: Apply in single pass, follow manufacturer's installation isntructions.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean substrate of substances that might interfere with penetration or performance of water repellents. Test for moisture content, according to water-repellent manufacturer's written instructions, to ensure that surface is dry enough. Remove oil, curing compounds, laitance, and other substances that could prevent adhesion or penetration of water repellents.

B. Test for pH level, according to water-repellent manufacturer's written instructions, to ensure chemical bond to silicate minerals.

C. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live trees, shrubs, plants and grass.

D. Coordination with Sealants: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.

1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those used in the work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

F. Protect adjacent surfaces not designated to receive water repellent.

G. Wait a minimum of 14 days before applying the water repellent to new concrete.

H. Apply water repellent on substrate and observe the rate of penetration. If it does not absorbed by the surface immediately, then additional cleaning of surface is required.

3.2 APPLICATION

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. Apply a heavy-saturation spray coating of water repellent on surfaces indicated for treatment using low-pressure spray equipment. Comply with manufacturer's written instructions for using airless spraying procedure, unless otherwise indicated.

C. Protect surfaces to be sealed from contamination between coats.

D. Apply a second saturation spray coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

E. Protect sealed surfaces during drying from traffic, damage and contamination.

F. Horizontal Application Instructions

1. Saturate in a single application at a coverage rate of 200 ft. /gal. (4.91 m/L).

2. Use enough to keep surface wet for 3-5 minutes.

3. Broom out puddles until they soak in.

3.3 PROTECTION

A. Protect treated surfaces from rain for a minimum of six hours.

B. Restrict foot traffic for a minimum of four hours at 68 degrees F (20 degrees C). This time may need to be extended based on air and surface temper

3.4 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Repair damage caused by water-repellent application. Comply with manufacturer's written cleaning instructions.

END OF SECTION 07 19 00

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
SECTION 07 21 00 - THERMAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Rigid insulation at cavity wall construction, perimeter foundation wall, and exterior wall between exterior wall sheathing and fiber cement siding.

B. Glass fiber batt/blanket insulation and vapor retarder in exterior wall and ceiling/roof construction.

C. Glass fiber batt/blanket insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof construction.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete; Foundation wall construction.

B. Section 04 2000 - Unit Masonry: Exterior masonry wall and masonry veneer construction.

C. Section 04 2300 - Glass Unit Masonry: Masonry veneer construction.

D. Section 04 7200 - Manufactured Stone Masonry: Masonry veneer construction.

E. Section 06 10 00 - Rough Carpentry: Exterior wall wood framing and sheathing.

F. Section 06 1753 - Shop-Fabricated Wood Trusses: Wood truss construction at exterior walls.

G. Section 07 27 00 - Air Barriers: Separate air barrier materials.

H. Section 07 4646 - Fiber-Cement Siding: Exterior siding installation.

I. Section 07 5423 - Thermoplastic Polyolefin (TPO) Membrane Roofing - Carlisle: Roofing insulation.

J. Section 09 2116 - Gypsum Board Assemblies: Gypsum wall and ceiling board.

1.3 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

C. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation; 2017.

D. ASTM D1621 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics; 2016.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

F. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C; 2022.

1.4 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

PART 2 PRODUCTS

2.1 APPLICATIONS

A. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

B. Insulation at Exterior of Wood Stud Framed Wall Sheathing Behind Fiber Cement Siding: Extruded polystyrene (XPS) board.

C. Insulation Inside Masonry Cavity Walls: Extruded polystyrene (XPS) board.

D. Insulation in Wood Framed Walls: Glass fiber blanket insulation with separate vapor retarder.

E. Insulation in Wood Framed Ceiling/Roof Construction: Glass fiber batt insulation with separate vapor retarder.

2.2 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.

1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.

2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.

3. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.

a. Thickness: See drawings.

4. Board Edges: Square.

5. Water Absorption: 0.3 percent by volume, maximum, by total immersion.

6. Products:

a. DuPont de Nemours, Inc; Styrofoam Brand Square Edge Foam Insulation and Styrofoam Brand Cavitymate Plus XPS Foam Insulation: building.dupont.com/#sle.

b. Kingspan Insulation LLC; GreenGuard GG25-L:G XPS Insulation Board: www.kingspan.com/#sle.

c. Owens Corning Corporation; Foamular Extruded Polystyrene (XPS) Insulation Board: www.ocbuildingspec.com/#sle.

2.3 GLASS FIBER INSULATION MATERIALS

A. Glass Fiber Batt/Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.

1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.

2. Thermal Resistance:

a. R-value of 20 minimum: 5 1/2 inch thick.

b. R-value of 49 minimum: 14 inch thick nomimal.

3. Facing: Unfaced.

4. Products:

   a. CertainTeed Corporation; Fiber Glass Blanket Insulation: www.certainteed.com/#sle.

   b. Johns Manville; Formaldehyde-Free Fiberglass Insulation: www.jm.com/#sle.

   c. Owens Corning Corporation; Pink Next Gen Fiberglas Insulation: www.ocbuildingspec.com/#sle.

2.4 Vapor Retarders

A. Type: Polyethelene Vapor Retarders: ASTM D 4397, clear.

B. Thickness: Minimum 6 mils thick nominal.

C. Water Vapor Permeance: Maximum permeance rating of 0.13 perm when tested in accordance with ASTM E96/E96M.

D. Seam and Perimeter Tape: Polyethylene self-adhering type, mesh reinforced, 2 inches wide minimum; compatible with sheet material.

E. Products:

1. Certainteed,Corp.; MemBrain, The SMART Vapor Retarder: www.certainteed.com/#sle.

2. ISI Building Products; Nu-Age 6-mil PE Sheeting: www.NuAgeFilms.com/#sle.

3. Tex-Trude; Polyethelene Construction Film: www.TEX-TRUDE.com/#sle.

4. Substitutions: See Section 01 6000 - Product Requirements.

2.5 ACCESSORIES

A. Air Barrier: See Section 07 2700.

B. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

C. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify that adhesive materials in contact with air barrier materials are compatible. See Section 07 2700 - Air Barriers.

C. Verify substrate surfaces are flat, free of materials or substances that may impede adhesive bond.

3.2 BOARD INSTALLATION AT INSIDE FOUNDATION PERIMETER

A. Apply adhesive to back of boards:

1. Three continuous beads per board length.

B. Install boards horizontally on inside of foundation prior to backfilling for installation of vapor barrier under cast-in-place concrete slab-on-grade.

1. Place boards to maximize adhesive contact.

2. Install in running bond pattern.

3. Butt edges and ends tightly to adjacent boards and to protrusions.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.3 BOARD INSTALLATION AT CAVITY WALLS

A. Apply adhesive to back of boards:

1. Three continuous beads per board length.

B. Install boards to fit snugly between wall ties.

C. Install boards horizontally on walls.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.4 BATT/BLANKET INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall spaces and ceiling/roof construction without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Retain batts in place in the ceiling/roof construction until installation of the ceiling vapor retarder.

F. At wood framing, place vapor retarder on warm side of insulation by stapling at 12 to 18 inches on center. Lap and seal sheet retarder joints over face of member.

1. Where vapor retarder transitions from ceiling/roof to wall condition, install vapor retarder without seams. Transition inside wall/ceiling condition to allow adequate material such that when ceiling board and wall board are installed they do not damage vapor rretarder.

2. Cover fasteners with seam tape.

G. Tape seal seams, laps, perimeter edges, ends, tears, cuts in vapor retarder providing an airtight seal.

H. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and to other items interrupting the plane of the membrane and to adjacent materials; tape seal in place.

3.5 PROTECTION

A. Do not permit installed insulation and vapor retarder to be damaged prior to its concealment.

END OF SECTION 07 21 00

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
SECTION 07 27 00 - AIR BARRIERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air barriers; both vapor permeable and vapor non-permeable.

1.2 RELATED REQUIREMENTS

A. Section 04 200 - Unit Masonry: Exterior wall construction.

B. Section 04 7200 - Cast Stone Masonry: Cast stone masonry trim.

C. Section 04 7300 - Manufacturered Stone Masonry: Manufactured stone masonry veneer.

D. Section 06 10 00 - Rough Carpentry: Exterior wall framing and exterior sheathing.

E. Section 07 2100 - Thermal Insulation: Rigid insulation.

1.3 DEFINITIONS

A. Permeable Air Barrier: Airtight barrier made of material that is virtually air impermeable but water vapor permeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

B. Non-Permeable Air Barrier: Airtight barrier made of material that is virtually air impermeable but water vapor impermeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

1.4 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.

B. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2010).

C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2017.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

F. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

G. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics and performance criteria.

1. Submit manufacturer's product data, installation instructions, and manufacturer's printed instructions for evaluating, preparing, and treating substrate(s), temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.

2. Submit letter from primary matertials manufacturer indicating approval of products not manufacturered by primary manufacturer.

3. Include statement that materials are compatible with adjacent materials proposed for use.

4. Submit report(s) indicating that field peel-adhesion test(s) on materials to which sealants are adhered have been performed and the changes made, if required, to other approved materialos to achieve successful adhesion.

C. Compatibility: Submit letter(s) from manufacturer stating that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials proposed for use. Submit letter(s) from manufacturer stating that any cleaning materials used during installation are chemically compatible with each adjacent material(s) proposed for use.

D. Shop Drawings: Provide drawings of special joint conditions and shop drawings showing locations and extent of air barrier assemblies and details of typical conditions, interesections withother envelope assemblies and materials, counter flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are applied, how materials that cover the air barrier are secured to and/or

through with the air tight condition maintained, and how miscellaneous penetrations such as conduits, pipes and similar items are sealed.

E. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

F. Installer's qualification statement.

1.6 QUALITY ASSURANCE

A. Manufacturer: Obtain primary, accessory transition membranes and termination sealants from a single specified manufacturer regularly engaged in manufacturing air barrier membranes and accessories.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience, and approved by manufacturer.

PART 2 PRODUCTS

2.1 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE) - OFFICE/MAINTENANCE BUILDING

A. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.

1. Air Barrier Membrane:

a. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.

b. Water Vapor Permeance: 11 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method, at 73.4 degrees F.

c. Product, Basis of Design:

1) W.R. Meadows, Inc; Air-Shield LMP: www.wrmeadows.com/#sle.

2.2 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR IMPERMEABLE) - WATER TREATMENT PLANT

A. Air and Vapor Barrier, Fluid-Applied:

1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.

2. Water Vapor Permeance: 1 perm, maximum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F.

3. Products, Basis of Design:

2.3 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.

B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement waived if not installed on roof.

C. Stainless Steel Flashing: Flexible flashing with 2 mil, 0.002 inch thick Type 304 stainless steel sheet, 8 mil, 0.008 inch of butyl adhesive and siliconized release liner.

1. Roll Length: 50 feet long.

2. Width: 6 inches wide.

3. Provide flashing abutment as detailed.

D. Thinners and Cleaners: As recommended by material manufacturer.

E. Air and Moisture Sealing Insulation Fasteners: Preassembled fastener units consisting of sealing washer, screw, and gasketing tube.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.2 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Self-Adhered Sheets:

1. Prepare substrate in accordance with sheet manufacturer's installation instructions; fill and tape joints in substrate and between dissimilar materials.

2. Lap sheets shingle fashion to shed water and seal laps airtight.

3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.

4. Use same material, or other material approved by sheet manufacturer, to seal to adjacent substrates, and as flashing.

5. At wide joints, provide extra flexible membrane allowing joint movement.

E. Fluid-Applied Coatings or Membranes:

1. Prepare substrate in accordance with manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.

2. Where exterior masonry veneer is being installed, install masonry anchors before installing air barrier over masonry; provide airtight seal around anchors.

3. Use flashing to seal to adjacent construction and to bridge joints in coating substrate.

F. Openings and Penetrations in Exterior Air Barriers:

1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto air barrier and at least 6 inches up jambs; mechanically fasten stretched edges.

2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.

3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.

4. At head of openings, install flashing under air barrier extending at least 2 inches beyond face of jambs; seal air barrier to flashing.

5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.

6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.3 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION 07 27 00

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
SECTION 07 41 13.16 - STANDING SEAM METAL ROOF PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Standing-seam metal roof panels, ridge ventilation and accessories.

B. Self-adhering, high-temperature underlayment, felt underlayment and slip sheet.

C. Metal flashing and trim.

D. Gutters, downspouts.

E. Roof curb(s).

1.2 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Concrete Masonry wall construction and through-wall flashing.

B. Section 06 1000 - Rough Carpentry: Roof sheathing and wood blocking.

C. Section 06 1753 - Shop-Fabricated Wood Trusses; Roof structure.

D. Section 07 4213.53 - Metal Soffit Panels.

E. Section 07 9200 - Joint Sealants.

F. Section 13 3419 - Metal Building Systems: Metal building related components including standing seam metal roof, gutters, downspouts and metal flashings.

1.3 REFERENCES

1.4 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

E. Qualification data for installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.

B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal roof panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness, with positive slope for drainage of water. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal roof panels during installation.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when current and forecasted weather conditions permit installation of metal roof panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal roof panel installation with rain drainage work, flashing, trim, construction of metal soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal roof panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.

b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: 45 years from date of Substantial Completion.

B. Warranty on Roof Panel and Metal Accessory Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels and accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Roof Panel and Accesssory Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: Manufacturer’s standard period from date of Substantial Completion.

a. Panel Coating: Furnish manufacturer's 40 year warranty covering cracking, checking, peeling or failure of paint to adhere to bare metal.

b. Panel fading and chalking: Furnish manufacturer's 30 year warranty.

C. Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: Manufacturer’s standard 25 year period from date of Substantial Completion.

2. Warranty shall include coverage for pipe, conduit, curb and any other penetrations made prior to the date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for steep -slope roof products.

B. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:

1. Three-year, aged solar reflectance of not less than 0.55 and emissivity of not less than 0.75.

2. Three-year, aged Solar Reflectance Index of not less than 64 when calculated according to ASTM E 1980.

C. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.

2. Other Design Loads: As indicated on Drawings.

3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

D. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 1680 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

F. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

G. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

H. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A-90.

2. Hail Resistance: MH.

I. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.

B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.

1. Basis-Of-Design: Subject to compliance with requirements, provide McElroy Metal, Inc., Maxima with double pencil-ribs, or approved comparable product.

2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

   a. Nominal Thickness: 0.028 inch (0.71 mm).

   b. Exterior Finish: Two-coat fluoropolymer.

   c. Color: As selected by Architect from manufacturer's full range.

3. Clips: One-piece fixed to accommodate thermal movement.

   a. Material: 0.028-inch- (0.71-mm-) nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.

   b. Material: 0.025-inch- (0.64-mm-) thick, stainless-steel sheet.

4. Joint Type: As standard with manufacturer.

5. Panel Coverage: 16 inches (406 mm).

6. Panel Standing Seam Height: 1.5 inches (38 mm).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer. Self-adhering, high-temperature underlayment product shall be one of those approved by metal roof panel manufacturer for installation with their metal roof panel system.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.

2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.

B. Felt Underlayment: ASTM D 226/D 22M, Type II (No. 30), asphalt-saturated organic felts.

C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight roof panel system including trim, fascia,gutters, downspouts, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.

2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal roof panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fascia, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

D. Gutters: Formed from same material as metal roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-

mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.

E. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

F. Roof Curbs: Fabricated from same material as metal roof panels, 0.048-inch (1.2-mm)] nominal thickness; with bottom of skirt profiled to match metal roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch- (1.52-mm-) nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.

1. Insulate roof curb with 1-inch- (25-mm-) thick, rigid insulation.

2. Minimum curb height: 12 inches measured at upslope portion of curb.

3. Coordinate curb opening dimensions and configuration with equipment mounted to the top of the curb.

4. Top of curb shall be fabricated level. Coordinate with roof slope. See drawings.

G. Panel Fasteners: Self-tapping screws designed to withstand design loads.

H. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.

3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

A. General: Fabricate and finish metal roof panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal roof panels may be fabricated on-site using UL-certified, portable roll-forming equipment if metal roof panels are of same profile and warranted by manufacturer to be equal to factory-formed metal roof panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide metal roof panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal roof panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.

5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.6 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Roof Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.

1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.

2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal roof panel manufacturer's written recommendations.

3.3 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the roof area indicated below:

a. Roof perimeter for a distance up from eaves of 36 inches (914 mm) beyond interior wall line(s).

b. Valleys, from lowest point to highest point, for a distance on each side of 18 inches (460 mm). Overlap ends of sheets not less than 6 inches (152 mm).

c. Rake edges for a distance of 18 inches (460 mm).

d. Hips and ridges for a distance on each side of 12 inches (305 mm).

e. Roof-to-wall intersections for a distance from wall of 18 inches (460 mm).

f. Around roof penetrating elements for a distance from element of 18 inches (460 mm).

B. Felt Underlayment: Apply at locations indicated below, in shingle fashion to shed water, and with lapped joints of not less than 2 inches (50 mm).

1. Apply on roof not covered by self-adhering sheet underlayment. Lap over edges of self-adhering sheet underlayment not less than 3 inches (75 mm), in shingle fashion to shed water.

C. Slip Sheet: Apply slip sheet over the self-adhering underlayment and the felt underlayment before installing metal roof panels.

3.4 METAL ROOF PANEL INSTALLATION

A. General: Install metal roof panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install metal roof panels perpendicular to supports unless otherwise indicated. Anchor metal roof panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal roof panels.

2. Flash and seal metal roof panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until underlayment that will be concealed by metal roof panels are installed.

3. Install screw fasteners in predrilled holes.

4. Locate and space fastenings in uniform vertical and horizontal alignment.

5. Install flashing and trim as metal roof panel work proceeds.

6. Align bottoms of metal roof panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.

7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal roof panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.

2. Install pressure plates at locations indicated in manufacturer's written installation instructions.

3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.

4. Watertight Installation:

a. Apply a continuous ribbon of sealant or tape to seal joints of metal roof panels, using sealant or tape as recommend in writing by metal roof panel manufacturer as needed to make panels watertight.

b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1-inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.

2. Connect downspouts to underground drainage system where indicated.

J. Roof Curbs: Install flashing around bases where they meet metal roof panels.

K. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal roof panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 41 13.16

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
SECTION 07 42 13.53 - METAL SOFFIT PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes metal soffit panels.

B. Related Sections:

1. Section 074113.13 "Formed Metal Roof Panels" for lap-seam metal roof panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.

b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: One year from date of Substantial Completion.

B. Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: Manufacturer’s standard period from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.

2. Other Design Loads: As indicated on Drawings.

3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METAL SOFFIT PANELS

A. General: Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Metal Soffit Panels, Basis-Of-Design: Subject to compliance with requirements, provide McElroy Metal, Inc., Matrix vented soffit panel, or approved comparable product.

C. V-Groove-Profile Metal Soffit Panels: Perforated panels formed with vertical panel edges and intermediate stiffening ribs symmetrically spaced between panel edges; with a V-groove joint between panels.

1. Material: Same material, finish, and color as metal roof panels.

2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50

(Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

a. Nominal Thickness: 0.022 inch (0.56 mm).

b. Panel Coverage: 16 inches (406 mm).

c. Exterior Finish: Two-coat fluoropolymer.

d. Color: As indicated by manufacturer's designations.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.

3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.

5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.

2. Examine sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal panel manufacturer.

    a. Verify that air- or water-resistive barriers been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

1. Soffit Framing: Wire tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.

2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.

3. Install screw fasteners in predrilled holes.

4. Locate and space fastenings in uniform vertical and horizontal alignment.

5. Install flashing and trim as metal panel work proceeds.

6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.

7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

2. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

3. Copper Panels: Use copper, stainless-steel, or hardware-bronze fasteners.

4. Stainless-Steel Panels: Use stainless-steel fasteners.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items true to line for neat and weathertight enclosure.

2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.

3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.

4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

E. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.

2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.

3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling, and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 13.53

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
SECTION 07 46 46 - FIBER-CEMENT SIDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiber-cement lap siding, factory applied finish.

B. Fiber-cement trim, factory applied finish.

C. Assessories.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Exterior wall framing and exterior sheathing.

B. Section 07 2100 - Thermal Insulation: Rigid insulation behind fiber-cement siding and trim.

C. Section 07 2700 - Air Barriers: Vapor permeable air barrier behing rigid insulation.

D. Section 07 92 00 - Joint Sealants.

1.3 REFERENCE STANDARDS

A. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets; 2008 (Reapproved 2016).

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data sheets on each product to be used, including:

1. Manufacturer's requirements for related materials to be installed by others.

2. Preparation instructions and recommendations.

3. Storage and handling requirements and recommendations.

4. Installation methods, including nail patterns.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.

C. Samples for initial color selection: Submit minimum 2 complete sets of available color(s) for each material, component that requires factory color selection(s) by Architect.

D. Confirmation Samples: Submit minimum 3 samples of each selected color previously submitted and approved. Confirmation sample shall be on specified base material minimum 4 inches x 4 inches in size. Confirmation sample(s) will not be returned to Contractor.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store materials in manufacturer's unopened packaging, with labels intact, until ready for installation.

B. Store materials under dry and waterproof cover, well ventilated, and elevated above grade on a flat surface.

1.6 FIELD CONDITIONS

A. Do not install siding materials when air temperature or relative humidity are outside manufacturer's limits.

PART 2 PRODUCTS

2.1 FIBER-CEMENT SIDING

A. Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.

1. Style: Standard lap style.

2. Texture: Cedarmill, non-beaded.

3. Length: 12 feet, nominal.

4. Width (Height): 7 1/4 inch with standard 6 inch exposure.

5. Thickness: 5/16 inch, nominal.

6. Finish: Factory applied primer; factory applied finish.

7. Color: As selected by Architect from manufacturer's full range of available colors.

8. Protective Coating: Factory apply manufacturer's standard protective laminate sheet . Do not remove until after cutting and installation. Remove immediately following installation as recommended by manufacturer.

9. Warranty: 50 year limited; transferable.

10. Products:

    a. James Hardie Building Products, Inc: www.jameshardie.com/#sle.

    b. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ACCESSORIES

A. Trim: Same material and texture as siding.

1. Width: 3 1/2 inch, unless shown otherwise.

2. Thickness: 5/4 inch.

3. Length: 12 feet, nominal without joints up to the maximum 12 foot length.

4. Finish: Factory applied primer; factory applied finish.

5. Color(s): As selected by Architect from manufacturer's full range of available colors.

6. Protective Coating: Factory apply manufacturer's standard protective laminate sheet . Do not remove until after cutting and installation. Remove immediately following installation as recommended by manufacturer.

B. Starter Strip: Same material as trim.

1. Width, Thickness: As recommended by fiber-cement siding manufacturer.

2. Length(s): Maximum length(s) possible.

C. Metal joint Flashing; Material and color as recommended by fiber-cement siding manufacturer for siding color.

1. Location(s): Concealed behind butt joints in fiber-cement siding.

2. Attachment: Attach to exterior wall cnstruction as recommended by fiber-cement siding manufacturer.

D. L - Shaped Metal Flashing: Material, shape and gage as recommended by fiber-cement siding manufacturer.

1. Color(s): As selected by Architect from manufacurer's full range of colors

E. Color Touchup: As recommended by fiber-cement siding manufacturer.

F. Fasteners: Stainless steel; length as required to penetrate, 1-1/4 inches, minimum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Do not begin until unacceptable conditions have been corrected.

C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

A. Install siding and trim in accordance with fiber-cement siding manufacturer's written instructions and recommendations.

1. Read warranty and comply with terms necessary to maintain warranty coverage.

2. Install starter strip(s) as recommended by fiber-cement siding manufacterer.

3. Use trim details as indicated on drawings. Where detail is not indicated, install trim as recommended by fiber-cement manufacturer

4. Touch up field cut edges before installing as required by manufacturer.

5. Pre-drill nail holes if necessary to prevent breakage.

6. Blind nail fiber-cement siding to the greatest extent possible. Where not possible, face nail and finish nail holes as recommended by fiber-cement manufacturer.

B. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses and install concealed joint flashing..

C. Do not install siding less than 6 inches from ground surface, or closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.

D. Install L shaped prefinished metal flashing where fiber-cement siding abutts another material as recommended by fiber-cement manufacturer. Install sealant as recommended by fiber-cement manufacturer.

END OF SECTION 07 46 46

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 07 54 23 - THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING - CARLISLE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Adhered system with thermoplastic polyolefin (TPO) roofing membrane.

B. Cover boards.

C. Insulation, flat and tapered.

D. Vapor barrier/base sheet.

E. Roofing expansion joints.

F. Metal fascia system.

G. Metal scuppers.

1.2 RELATED REQUIREMENTS

A. Section 03 4100 - Precast Structural Concrete: Precast double tees and topping slab.

B. Section 04 2000 - Unit Masonry: Wall construction.

C. Section 06 1000 - Rough Carpentry: Treated wood blocking.

D. Section 07 4113.16 Standing Seam Metal Roof Panels: Downspouts.

E. Section 07 9200 - Joint Sealants: Sealant at bottom edge of metal fascia system and for locations other than required by roof system manufacturer.

1.3 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023.

C. ASTM D4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method; 1983 (Reapproved 2012).

D. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2017.

E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

F. FM DS 1-28 - Wind Design; 2007.

G. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components; Factory Mutual System; 2006.

H. NRCA (RM) - The NRCA Roofing Manual; 2017.

I. UL (FRD) - Fire Resistance Directory; Current Edition.

J. UL 790 - Standard for Standard Test Methods for Fire Tests of Roof Coverings; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. Product Data: Provide manufacturer's written information listed below.

1. Product data indicating vapor barrier/base sheet, membrane materials, flashing materials, insulation, and surfacing.

2. Preparation instructions and recommendations.

3. Storage and handling requirements.

B. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, and setting plan for flat and tapered insulation and plan, details for metal fascia system and scupper flashing details.

C. Samples for Selection: Submit two samples 4 by 4 inches in size illustrating vapor retarder, membrane and insulation.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.

F. Warranty:

1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

2. Submit installer's certification that installation complies with all warranty conditions for the roof membrane.

G. Installer's Qualification Statement.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section:

1. With minimum five (5) years documented experience.

2. Approved by roof system membrane manufacturer.

B. Single Source Responsibility: Furnish and install products from single source.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

B. Protect products in weather protected environment, clear of ground and moisture.

C. Protect foam insulation from direct exposure to sunlight.

D. Provide Safety Data Sheets (SDS) at the project site at all times during transportation, storage, and installation of materials.

1.7 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather. Refer to manufacturer's written instructions.

B. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

D. Proceed with work so new roofing materials are not subject to construction traffic as work progresses.

E. Do not allow grease, oil, fats, or other contaminants to come into direct contact with membrane.

1.8 CLOSEOUT SUBMITTALS

A. Executed Manfucturer's Warranty.

1.9 WARRANTY

A. Roof System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.

1. Warranty Term: 20 years.

2. For repair and replacement include costs of both material and labor in warranty.

3. Include accidental punctures according to the manufacturer's standard warranty terms.

4. Include hail damage according to the manufacturer's standard warranty terms.

5. Exceptions NOT Permitted:

a. Damage due to wind of speed greater than 56 mph but less than 90 mph.

6. Include metal fascia system and metal components that are a part of the scupper details as part of the manufacturer's warranty. Include TPO roofing membrane, cover boards, insulation, both flat and tapered, vapor barrier/base sheet, roofing expansion joints and walkway pads.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Source Limitations: Obtain components including roof insulation and fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

B. Basis of Design:

1. Carlisle SynTec; Sure-Weld TPO: www.carlisle-syntec.com/sle.

C. Other Acceptable Manufacturers (dependant on meeting Basis of Design and specification criteria):

1. Elevate; Ultra TPO Roofing Systems: www.holcumelevate.com/#sle.

2. Johns Manville; JM TPO Roofing Membrane: jm.com/#sle.

3. Mule-Hide Products Co, Inc.; Mule Hide TPO- FR Membrane: wwwule-hide.com/#sle.

4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ROOFING APPLICATIONS

A. TPO Membrane Roofing: One ply reinforced membrane, fully adhered with heat welded seams, over insulation, cover board and vapor barrier/base sheet.

B. Roofing Assembly Performance Requirements and Design Criteria:

1. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated on drawings as applicable.

2. Roof Covering External Fire Resistance Classification: Class A when tested per UL 790.

3. Wind Uplift:

a. Designed to withstand wind uplift forces calculated with ASCE 7.

4. Drainage: No standing water within 48 hours after precipitation.

2.3 ROOFING MEMBRANE

A. Single Source Responsibility: Furnish and install membrane products and accessories from single source.

B. Membrane:

1. Material: Thermoplastic Polyolefin (TPO) complying with ASTM D6878/D6878M.

2. Reinforcing: Internal fabric.

3. Thickness: 60 mils (0.060 inch), minimum.

4. Sheet Width: Factory fabricated into largest sheets possible.

5. Color: Gray.

C. Seaming Materials: As recommended by membrane manufacturer.

2.4 ACCESSORIES

A. Vapor Barrier/Base Sheet: Self-adhering, rubberized asphalt membrane laminated to spun-bonded polyester fabric; 40 mil, 0.040 inch thick, minimum.

1. Product: Carlisle VapAir Seal 725TR Air/Vapor Barrier.

2. Comparable vapor barrier/base sheet product approved by each of the other roof system manufacturers.

B. Flexible Flashing Material: Same material as membrane.

C. Base Flashing: Provide waterproof, fully adhered base flashing system at all penetrations, plane transitions, and terminations.

D. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.

1. Composition: Roofing membrane manufacturer's standard.

2. Surface color: As selected by Architect from manufacturer's full range of colors.

3. Products: As approved by roof system manufacturer.

2.5 COVER BOARDS

A. Cover Board: Glass mat faced gypsum panels, ASTM C1177, fire resistant type.

1. Board Thickness: 5/8 inch.

2. Products: As approved by roof system manufacturer.

2.6 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: ASTM C1289, Type II, Class 1 - Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.

1. Grade and Compressive Strength: Grade 2, 20 psi, minimum.

2. Board Size: 48 x 48 inches (1220 x 1220 mm) unless required otherwise by roof system manufacturer.

3. Board Thickness:

a. Layer 1; Adhered directly to vapor barrier/base sheet: Minimum 2.6 inches.

b. Layer 2; Adhered dircectly to first layer (Layer 1) insulation: Minimum 2.6 inches.

4. Thermal Resistance, R-value (RSI-value): At 1-1/2 inches thick; Class 1-2-3 - 8.4 at 75 degrees F.

5. Tapered Boards, crickets, saddles: Slope as indicated on drawings; minimum thickness 1/2 inch; fabricate of fewest layers possible. Where slope is not indicated, provide minimum slope recommended by roof system manufacturer for conditions involved

a. Material: Same as flat insulation boards.

6. Board Edges: Square.

7. Products: As approved by roof system manufacturer.

2.7 METAL FASCIA SYSTEM

A. Metal Fascia System: Manufacturer's standard snap-on metal edge member serving as termination of roof membrane at the outside edge of the parapet and retainer for metal fascia; watertight with no exposed fasteners attached through pre-punched holes; mounted to parapet nailer at outside edge.

1. Functional Characteristics: Fascia retainer supports while allowing for free thermal cycling of fascia

B. Description: Two-piece; 45 degree sloped minimum 22` gauge galvanized steel sheet edge member securing top and bottom edges of formed metal fascia and 24 gauge galvanized steel spring clip at 4' - 0" on center.

C. Fascia Pull-Off Resistance: At least the minimum required when tested in accordance with ANSI/SPRI ES-1 Test Method RE-1, Current edition.

D. Fascia Face Height: 6 3/4 inch total.

1. Fascia Face Height Above Nailer: 2 3/8 inch.

E. Fascia Material and Finish: Minimum 0.040 aluminum with Kynar 500 finish; matching concealed joint splice plates; factory installed protective plastic film coating.

1. Color: As selected by Architect from manufacturer's full range of solid colors.

F. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, scuppers, and end caps; minimum 14 inch long legs on corner pieces.

1. Downspouts: See Section 07 4113.16 Standing Seam Metal Roof Panels.

G. Manufacturer:

1. Basis of Design:

a. Carlisle Syntec; SecurEdge 200 Fascia, Model FA-65: www.carlisle-syntec.com/#sle.

2. Other Acceptable Manufacturers (dependant on meeting Basis of Design and specification criteria):

   a. Elevate: www.holcumelevate.com/#sle.

   b. Johns Manville: jm.com/#sle.

   c. Mule-Hide Products Co, Inc.: wwwule-hide.com/#sle.

   d. Substitutions: See Section 01 60 00 - Product Requirements.

2.8 ACCESSORIES

A. Prefabricated Flashing Accessories:

1. Corners and Seams: Same material as membrane, in manufacturer's standard thicknesses.

2. Penetrations: Same material as membrane, with manufacturer's standard cut-outs, rigid inserts, clamping rings, and flanges.

3. Pressure Sensitive Cover Strips: 6 inch wide, 45 mils (0.045 inch) thick, non-reinforced TPO membrane laminated to 35 mils (0.035 inch) thick cured synthetic rubber with pressure sensitive adhesive.

4. Miscellaneous Flashing: Non-reinforced TPO membrane; 80 mils (0.080 inch) thick, in manufacturer's standard lengths and widths.

B. Insulation Adhesive: Two component polyurethane, expanding foam as approved by roof system manufacturer.

C. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches wide; self adhering.

D. Membrane Adhesive: As recommended by membrane manufacturer.

E. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

F. Sealants: As recommended by roof system membrane manufacturer.

G. Cleaner: Manufacturer's standard, clear, solvent-based cleaner.

H. Edgings and Terminations: Manufacturer's standard edge and termination accessories.

I. Sponge Tubing for use at expansion joint detail. See drawings.

1. Type, Size: As recommended by roof system manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and nailing strips are in place.

3.2 PREPARATION, GENERAL

A. Clean substrate thoroughly prior to roof application.

B. Do not begin work until other work that requires foot or equipment traffic on roof is complete.

3.3 CONCRETE DECK PREPARATION

A. Fill surface honeycomb and variations with latex filler as recommended by roof system manufacturer.

B. Confirm dry deck by moisture meter with 12 percent moisture maximum when tested per ASTM D4263.

3.4 INSTALLATION - GENERAL

A. Perform work in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Do not apply vapor barrier/base sheet or roofing membrane during unsuitable weather.

C. Do not apply vapor barrier/base sheet or roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

D. Do not apply vapor barrier/base sheet or roofing membrane to damp or frozen concrete deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

F. Coordinate the work with installation of associated counterflashings installed by other sections as the work of this section proceeds.

3.5 INSULATION APPLICATION

A. Apply vapor barrier/base sheet to concrete roof deck surface with adhesive in accordance with manufacturer's instructions. Apply primer in preparation for application of the adhesive where recommended by roof system manufacturer. Allow primer to dry prior to application of adhesive.

1. Install flexible flashing from vapor barrier/base sheet to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.

B. Ensure vapor barrier/base sheet is clean and dry, continuous, and ready for application of insulation.

C. Attachment of Insulation: Embed insulation in adhesive in full contact, in accordance with roofing and insulation manufacturers' instructions.

D. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.

E. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

F. Lay boards with edges in moderate contact without forcing, and gap between boards no greater than 1/4 inch. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

G. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.

H. Do not apply more insulation than can be completely waterproofed in the same day.

3.6 MEMBRANE APPLICATION

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: Apply adhesive at manufacturer's recommended rate. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

D. Seam Welding:

1. Seam Welding: Overlap edges and ends and seal seams by heat welding, minimum 2 inches.

2. Cover seams with manufacturer's recommended joint covers.

3. Probe seams once welds have thoroughly cooled. (Approximately 30 minutes.)

4. Repair deficient seams within the same day.

5. Seal cut edges of reinforced membrane after seam probe is complete.

E. At intersections with vertical surfaces:

1. Extend membrane over up a minimum of 6 inches onto vertical surfaces.

2. Fully adhere flexible flashing over membrane and up to terminations per details.

F. At parapet walls, extend roof membrane, flashing up inside face of wall, over top of parapet and down face of exterior wall behind roof edge fascia. Terminate as recommended by roof system manufacturer to meet warranty requirements.

G. Coordinate installation of roof scuppers, downspouts and related flashings. Locate all field splices away from low areas. Lap upslope sheet over downslope sheet.

H. Install walkway pads at location(s) shown on Drawings. Space pad joints to permit drainage.

I. Daily Seal: Install daily seal per manufacturers instructions at the end of each work day. Prevent infiltration of water at incomplete flashings, terminations, and at unfinished membrane edges.

3.7 CLEANING

A. Remove wrappings, empty containers, paper, and other debris from the roof daily. Dispose of debris in compliance with local, State, and Federal regulations.

B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

C. Repair or replace defaced or damaged finishes caused by work of this section.

3.8 PROTECTION

A. Protect installed roofing and flashings from construction operations until project Substantial Completion.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials that are acceptable to roof system manufacturer.

END OF SECTION 07 54 23

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manufactured Products:

a. Manufactured through-wall flashing and counterflashing.

2. Formed Products:

a. Formed roof-drainage sheet metal fabrications.

b. Formed wall sheet metal fabrications.

B. Related Sections:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.

1.3 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

1. Identification of material, thickness, weight, and finish for each item and location in Project.

2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.

3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.

4. Details of termination points and assemblies, including fixed points.

5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.

6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counter flashings as applicable.

7. Details of special conditions.

8. Details of connections to adjoining work.

9. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

D. Qualification Data: For qualified fabricator.

E. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

F. Warranty: Sample of warranty.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 WARRANTY

A. Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: Manufacturer’s standard period from date of Substantial Completion.

PART 2 PRODUCTS

2.1 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.

1. Surface: Smooth, flat.

2. Exposed Coil-Coated Finishes:

a. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

3. Color: Match Architect's samples.

4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.

1. Finish: 4 (polished directional satin).

2. Surface: Smooth, flat.

D. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; structural quality.

2. Surface: Smooth, flat.

3. Exposed Coil-Coated Finish:

a. Four-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat and clear coats. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

4. Color: Match Architect's samples.

5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.2 UNDERLAYMENT MATERIALS

A. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.

B. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

C. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.

2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.

D. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.

b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

4. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

E. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

J. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

K. Do not use graphite pencils to mark metal surfaces.

2.5 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch- high, end dams where flashing is discontinuous. Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.

1. Gutter Style: K Style; As shown on drawings.

2. Expansion Joints: Butt type with cover plate.

3. Accessories:

   a. Continuous screened leaf guard with sheet metal frame.

   b. Flat End Caps (all ends).

   c. Valley Splash Guards (all valley corners).

   d. Preformed Kick-out Diverter Flashing (all locations where gutter ends meet vertical construction).

4. Gutters with Girth up to 15 Inches: Fabricate from the following materials:

   a. Aluminum: 0.032 inch thick.

B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Hanger Style: Manufacturer’s standard.

2. Fabricate from the following materials:

   a. Aluminum: 0.024 inch thick.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. General: Install underlayment as indicated on Drawings.

B. Polyethylene Sheet: Install polyethylene sheet with adhesive for anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches.

C. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

D. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

5. Install sealant tape where indicated.

6. Torch cutting of sheet metal flashing and trim is not permitted.

7. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints as shown and as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F , set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel and aluminum sheet.

2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

G. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets and/or straps spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Fasten gutter spacers to front and back of gutter.

2. Loosely lock straps to front gutter bead and anchor to roof deck.

3. Anchor and loosely lock back edge of gutter to continuous eave or apron flashing.

4. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.

5. Anchor gutter with spikes and ferrules spaced not more than 24 inches apart.

6. Install gutter with expansion joints at locations not to exceed, 50 feet apart. Install expansion-joint caps.

7. Install wire ball downspout strainers.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.

2. Provide elbows at base of downspout to direct water away from building.

3. Connect downspouts to underground drainage system indicated.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.

1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch centers.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of interlocking folded seam or blind rivets and sealant.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 04 Section "Unit Masonry."

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
SECTION 07 72 53 - SNOW GUARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Standing seam-mountd rail-type snow guards.

1.2 RELATED REQUIREMENTS

A. Section 07 4113.16 - Standing Seam Metal Roof Panels: Rail insert color strip material.

1.3 REFERENCE STANDARDS

A. Aluminum Association (AA) - Aluminum Standards and Data, Current EDition.

B. ASTM A484/A484M - Standard Specification for General Requirements for Stainless Steel Bars, Billets and Forgings, 2016.

C. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing, 2016.

D. ASTM A555/A555M - Standard Specification for General Requirements for Stainless Steel Wire and Wire Rods, 2016.

E. ASTM B85 - Standard Specification for Aluminum-Alloy Die Castings, 2003.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes, 2004a.

G. ASTM F836M - Standard Specification for Style 1 Stainless Steel Metric Nuts (Metric), 2002 (Current).

H. ASTM F880 - Standard Specification for Stainless Steel Socket, Square Head, Torx and Slotted Headless-Setscrews, 2012.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for snow guards.

B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.

1. Include details of rail-type snow guards.

2. Include calculation of number and location of snow guards based on snow load, roof slope, roof type, components, spacings, and finish.

C. Samples: Standing seam clamp, bracket, and minimum 12-inch- (300-mm-) long cross member, splice connector, snow clip and minimum 12-inch- (300-mm-) long rail insert color strip.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer that specializes in the production of snow guard products of the type specified with a minimum of 10 years documented experience.

B. Installer Qualifications: Installer that specializes inmetal roof system installation and installation of snow guard products with a minimum of 5 years documented experience.

C. Mockup:

1. Size: Minimum 8 feet long.

2. Illustrate: Snow guard attachment, cross members with inserted color strips, and accessories.

3. Location: Where directed by Architect.

4. Approved mockup may remain as part of the Work.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver components properly packaged to provide protection during transportation and unloading.

B. Store components in manufacturer's original labeled and unopened packaging in a clean and dry location, protected from potential damage until ready for installation.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener dis-engagement due to defective manufacture, fabrication, installation, or other defects in construction.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Structural Performance:

1. Snow Loads: As indicated on Drawings.

2.2 STANDING SEAM-MOUNTED RAIL-TYPE SNOW GUARDS

A. Standing Seam-Mounted, Rail-Type Snow Guards:

1. Basis-Of-Design:

a. Subject to compliance with requirements, provide McElroy Metal, S-5! ColorGard Snow Retention System: www.S-5.com/#sle.

b. Substitutions: Comparable product approved by metal roof panel manufacturer.

2. Description: Snow guard rails fabricated from metal bars, or extrusions, anchored to metal roof panel system standing seam component and equipped with one rail with color-matching inserts of material used for metal roofing panel system.

a. Standing seam clamps:

1) Material: Aluminum extrusions conforming to ASTM B221 or aluminum castings conforming to ASTM B85 and to AA Aluminum Standards and Data.

2) Clamp model: As recommended by manufacturer for the specific standing seam configuration/profile used on the project.

3) Setscrews: 300 series stainless steel, 18-8 alloy, 3/8 inch (9.525 mm) diameter, with round nose point.

4) Bracket attachment bolts: 300 series stainless steel, 18-8 alloy, 8 mm diameter, hex flange bolt. Coordinate thread length with bracket.

b. Brackets:

1) Material: Aluminum extrusions conforming to ASTM B221 and AA Aluminum Standards and Data.

2) Bracket model: S-5! ColorGard VersaClip: www.

a) Substitutions: Comparable product approved by metal roof panel manufacturer.

c. Cross Members:

1) Material: Aluminum extrusions conforming to ASTM B221 and to AA Aluminum Standards and Data, unpunched.

2) Provide receptor in face of cross members to receive rail insert color strips.

3) Length(s): Manufactuer's standard. Do not extend unsupported end farther than recommended by standing seam-mounted rail-type snow guard manufacturer's recommendation.

4) Provide aluminum extruded splice connectors to ensure alingment and structural continuity at cross member end joints. Splice connector shall be constructed to provide a space between each cross member to allow for expansion/contraction.

5) Rail insert color strips:

a) Material: Same material as metal roof panels. See Section 07 4113.16. Obtain material from metal roof panel manufacturer.

b) Strip length(s): One piece, full length of cross member.

c) Color: Match exposed surface color of metal roof panels.

6) Snow clip:

a) Material: Aluminum extrusions conforming to ASTM B221 and AA Aluminum Standards and Data.

b) Profile: Coordinate with cross section of cross member.

c) Fabrication:

1 Where fabricated to include rubber insert feet, snow clip shall rest against the surface of the metal roof panel once installed.

d) Location:

1 Where standing seam clamps are attached at every standing seam, snow clip shall be attached to the cross member at each center point between standing seams.

2 Placement of snow clips shall not conflict with the pencil ribbing of the standing seam metal roof panels.

3. Loaction(s): See drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with metal roofing panel Installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.

1. Verify compatibility with and suitability of substrates including compatibility with metal roofing panel finishes.

B. Prior to beginning installation, verify:

1. Metal roof panel seaming is complete.

2. Metal roof panel attachment is sufficient to withstand loads applied by standing seam-mounted rail-type snow guards.

3. Standing seam-mounted rail-type snow guard installation will not impede roof drainage.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare substrates as required for installing rail-type snow guards.

B. Measure location of standing seam-mounted rail-type snow guards on the roof(s) related to the eave. Use string line or laser to identify locataion for the installation of each clamp position.

C. Prepare standing seam clamps as recommended by snow guard manufacturer. Start setscrews by hand threading. Locate setscrews on same side of clamp as required by clamp model and standing seam configuration.

3.3 INSTALLATION

A. Attachment for Standing-Seam Metal Roofing:

1. Do not use fasteners that will penetrate metal roofing, or fastening methods that void metal roofing finish warranty or weathertightness warranty.

2. Standing Seam-Mounted, Rail-Type Snow Guards: Install as recommended by the standing seam-mounted, rail-type snow guard manufacturer using extruded or cast aluminum clamps attached to vertical ribs of standing-seam metal roof panels.

B. Install standing seam-mounted, rail-type snow guards in accordance with manufacer's written instructions and approved shop drawings.

C. Install clamps to metal panel standing seams at maximum 32 inches on center. Torque setscrews as recommended by standing-seam-mounted, rail-type snow guard manufacturer's written instructions.

D. Install brackets and cross members to standing seam clamps in accordance with manufactrure's written instructions.

1. Install extruded splice connectors to connect sections of cross members together to form a continuous length not to exceed manufacturer's maximum recommended length without an expansion joint.

2. Slide snow clips onto cross member and place one between each pair of standing seams. Adjust to final location(s) as system is installed.

3. Install rail insert color strips as recommended by standing seam-mounted, rail-type snow guard manufacturer.

E. Confirm that all components are at required spacings and are attached as recommended by standing seam-mounted rail-type snow guard manufacturer.

END OF SECTION 07 72 53

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
SECTION 07 92 00 - JOINT SEALANTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Urethane joint sealants.

2. Latex joint sealants.

3. Acoustical joint sealants.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.

2. Division 06 Section “Plastic Paneling” for sealing FRP paneling.

3. Division 08 Section "Glazing" for glazing sealants.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.

2. Joint-sealant manufacturer and product name.

3. Joint-sealant formulation.

4. Joint-sealant color.

D. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

E. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

1.5 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.

2. When joint substrates are wet.

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 WARRANTY

A. Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

B. Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.

2. Disintegration of joint substrates from natural causes exceeding design specifications.

3. Mechanical damage caused by individuals, tools, or other outside agents.

4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 URETHANE JOINT SEALANTS

A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Sika Corporation, Construction Products Division; Sikaflex - 15LM.

b. Tremco Incorporated; Vulkem 921.

B. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Polymeric Systems, Inc.; PSI-901.

C. Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Pecora Corporation; Urexpan NR-201.

b. Polymeric Systems, Inc.; Flexiprene 952.

c. Sika Corporation. Construction Products Division; Sikaflex - 1CSL.

d. Tremco Incorporated; Vulkem 45.

D. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Pecora Corporation; Dynatrol II.

b. Polymeric Systems, Inc.; PSI-270.

c. Tremco Incorporated; Dymeric 240.

E. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Pecora Corporation; Dynatred.

b. Sika Corporation, Construction Products Division; Sikaflex - 2c NS.

c. Tremco Incorporated; Vulkem 227.

F. Immersible Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920. Type M, Grade P, Class 25, for Use T and I.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Tremco Incorporated; Vulkem 245.

2.3 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Pecora Corporation; AC-20+.

b. Tremco Incorporated; Tremflex 834.

2.4 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements:

a. Pecora Corporation; AIS-919.

b. USG Corporation; SHEETROCK Acoustical Sealant.

2.5 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining

after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

a. Concrete.

b. Masonry.

c. Unglazed surfaces of ceramic tile.

d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

a. Metal.

b. Glass.

c. Porcelain enamel.

d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.

2. Do not stretch, twist, puncture, or tear sealant backings.

3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.

2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.

5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints in unit masonry.

b. Joints between metal panels.

c. Joints between different materials listed above.

d. Perimeter joints between materials listed above and frames of doors windows and louvers.

2. Urethane Joint Sealant: Single component, nonsag, Class 100/50.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.

2. Urethane Joint Sealant: Single component, pourable, traffic grade.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.

b. Perimeter joints of exterior openings where indicated.

c. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.

d. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.

2. Joint Sealant: Latex.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.

2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Location:

a. Acoustical joints where indicated.

2. Joint Sealant: Acoustical.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 07 92 00

DIVISION 08 - OPENINGS
SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard hollow metal doors and frames.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.

2. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.

3. Division 09 Sections "Interior Painting" and “High Performance Coatings” for field painting hollow metal doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.

2. Details of doors, including vertical and horizontal edge details and metal thicknesses.

3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.

4. Locations of reinforcement and preparations for hardware.

5. Details of each different wall opening condition.

6. Details of anchorages, joints, field splices, and connections.

7. Details of accessories.

8. Details of moldings, removable stops, and glazing.

9. Details of conduit and preparations for power, signal, and control systems.

C. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Quality Assurance: Fire Rated Door Assemblies to read: Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL 10C and on testing according to NFPA 252 as required in NFPA 101.Retain first subparagraph below if applicable and acceptable to authorities having jurisdiction.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

C. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ceco Door Products; an Assa Abloy Group company.

2. Curries Company; an Assa Abloy Group company.

3. Steelcraft; an Ingersoll-Rand company.

4. Windsor Republic.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

H. Glazing: Comply with requirements in Division 08 Section "Glazing."

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush panel.

2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.

a. Fire Door Core: As required to provide fire-protection ratings indicated.

b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

1) Locations: Exterior doors.

3. Vertical Edges for Single-Acting Doors: Manufacturer's standard.

4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.

5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.

6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.

1. Fabricate frames with mitered or coped corners.

2. Fabricate frames as full profile welded unless otherwise indicated.

3. Frames for Level 3 Steel Doors: 0.053-inch- thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.

1. Fabricate frames with mitered or coped corners.

2. Fabricate frames as full profile welded unless otherwise indicated.

3. Frames for Level 3 Steel Doors: 0.053-inch- thick steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.

2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- wide steel.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

2. Glazed Lites: Factory cut openings in doors.

3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

2. Frames in Concrete and Masonry Construction: All frames in masonry and concrete construction shall be back primed with manufacturer’s standard bitumastic coating.

3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

6. Jamb Anchors: Provide number and spacing of anchors as follows:

   a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

      1) Two anchors per jamb up to 60 inches high.

      2) Three anchors per jamb from 60 to 90 inches high.

      3) Four anchors per jamb from 90 to 120 inches high.

      4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.

2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.

3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

a. At fire-protection-rated openings, install frames according to NFPA 80.

b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.

c. Install frames with removable glazing stops located on secure side of opening.

d. Install door silencers in frames before grouting.

e. Remove temporary braces necessary for installation only after frames have been properly set and secured.

f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

4. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.

5. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

   a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.

   b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.

   c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.

   d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3. Smoke-Control Doors: Install doors according to NFPA 105.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and

replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 08 11 13

DIVISION 08 - OPENINGS
SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Factory finished, flush wood doors.

1.2 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames: Hollow metal door frames.

B. Section 08 71 00 - Door Hardware.

C. Section 08 80 00 - Glazing.

1.3 REFERENCE STANDARDS

A. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

C. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; 2011.

D. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.4 SUBMITTALS

A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

B. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

C. Samples: Submit two samples of door veneer, 6 by 6 inches in size illustrating wood grain, stain color, and sheen.

D. Manufacturer's Installation Instructions: Indicate special installation instructions.

E. Specimen warranty.

F. Warranty, executed in Owner's name.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.7 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.

1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Wood Veneer Faced Doors:

1. Basis of Design: VT Industries, Inc.; Heritage Collection: www.vtindustries.com/#sle.

2. Other acceptable manufactuers/products:

a. Haley Brothers: www.haleybros.com/#sle.

b. Forte Opening Solutions; Cendura Standard Wood Veneer Doors: www.forteopenings.com/#sle.

c. Masonite Architectural; Aspiro Select Wood Veneer Doors: www.architectural masonite.com/#sle.

d. Oregon Door: www.oregondoor.com/#sle.

2.2 DOORS

A. Doors: See drawings for locations and additional requirements.

1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with WDMA I.S. 1A.

2. Wood Veneer Faced Doors: 5-ply or 7-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.

1. Provide solid core doors at each location.

2. Wood veneer facing with factory transparent finish as indicated on drawings.

2.3 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

2.4 DOOR FACINGS

A. Veneer Facing for Factory Finish: Select white maple, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.

1. Vertical Edges: Same species as face veneer.

2.5 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:

1. Provide solid blocks at lock edge for hardware reinforcement.

2. Provide solid blocking for other throughbolted hardware.

C. Glazed Door Openings: Non-removable stops on secure side; sizes and configurations as indicated on drawings.

D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

F. Provide edge clearances in accordance with the quality standard specified.

2.6 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:

1. Opaque:

a. System - OP-8, UV Cured Acrylated Polyester/Urethane.

b. Color: Onyx ON18.

c. Sheen: Flat.

B. Factory finish doors in accordance with approved sample.

C. Seal door top edge with color sealer to match door facing.

2.7 ACCESSORIES

A. Hollow Metal Door Frames: See Section 08 11 13.

B. Glazed Openings:

1. Factory glazing required.

2. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.

3. Glazing: Single vision units, 1/4 inch thick glass.

4. Tint: Clear.

C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

D. Door Hardware: See Section 08 7100.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

3.3 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.4 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION 08 14 16

DIVISION 08 - OPENINGS
SECTION 08 33 23 - OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Insulated motor operated service doors.

B. Related Requirements:

1. Section 03 3000 - Cast-In-Place Concrete: Wall constrcution.

2. Section 04 2000 - Unit Masonry: Wall constyruction.

3. Section 05 5000 - Metal Fabrications: Miscellaneous metal related to door mounting.

4. Section 13 3419 - Metal Building Systems: Wall construction.

5. Divison 26 - Electrical: Electrical connections.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.

2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

3. Include description of automatic closing device and testing and resetting instructions.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.

2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.

3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.

4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.

5. Show locations of controls, locking devices, and other accessories.

6. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

D. Delegated-Design Submittal: For overhead coiling doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Summary of forces and loads on walls and jambs.

E. Qualification Data: For qualified Installer.

F. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.

C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

PART 2 PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.

1. Design Wind Load: As indicated on Drawings.

2. Testing: According to ASTM E 330.

3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.

4. Operability under Wind Load: Design overhead coiling doors to remain operable under uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa) wind load, acting inward and outward.

2.3 DOOR ASSEMBLY

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

1. Wayne-Dalton Corp.

2. Raynor Garage Doors.

B. Operation Cycles: Door components and operators capable of operating for not less than 20,000 cycles. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

C. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. (0.406 L/s per sq. m)] at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to ASTM E 283.

D. STC Rating: 26.

E. Curtain R-Value: 5.0 deg F x h x sq. ft./Btu (0.881 K x sq. m/W).

F. Door Curtain Material: Aluminum.

G. Door Curtain Slats: Insulated flat profile slats of manufacturer’s standard center-to-center height.

1. Gasket Seal. Manufacturer's standard continuous gaskets between slats.

H. Bottom Bar: Manufacturer’s standard and finished to match door.

I. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

J. Hood: Match curtain material and finish.

K. Emergency Manual Door Operator: Chain-hoist operator.

1. Provide operator with through-wall shaft operation.

L. Electric Door Operator:

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.

2. Operator Location: Bracket mounted, front of hood.

3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet (2.44 m) or lower.

4. Motor Exposure: Interior.

5. Emergency Manual Operation: Chain type.

6. Obstruction-Detection Device: Automatic photoelectric sensor; Electric sensor edge on bottom bar or pneumatic sensor edge; Self-monitoring type.

a. Sensor Edge Bulb Color: Black.

7. Control Station(s): Interior mounted on wall adjacent each door.

a. Coordinate location(s) to avoid conflict between chain hoist and door control station(s).

M. Curtain Accessories: Equip door with weatherseals.

N. Door Finish:

1. A Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.

2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Aluminum Door Curtain Slats: ASTM B 209 (ASTM B 209M) sheet or ASTM B 221 (ASTM B 221M) extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch (1.27 mm); and as required.

2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84 or UL 723. Enclose insulation completely within slat faces.

3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum aluminum thickness of 0.032 inch (0.80 mm).

4. Gasket Seal: Provide insulated slats with manufacturer's standard interior-to-exterior thermal break or with continuous gaskets between slats.

B. Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.6 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Aluminum: 0.040-inch- (1.02-mm-) thick aluminum sheet complying with ASTM B 209 (ASTM B 209M), of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.

2. Hood Baffle: Provide hood baffle with rubber seal(s) to inhibit air infiltration through the hood cavity.

3. Headre Seal: Provide "Z" shaped aluminum retainer with EPDM rubber to inhibit air infiltration between the header and the curtain.

2.7 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Cylinders standard with manufacturer and keyed to building keying system.

2. Keys: Provide three for each cylinder.

B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 CURTAIN ACCESSORIES

A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.

1. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous-sheet baffle secured to inside of hood or field- installed on the header.

2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene.

2.9 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 MANUAL DOOR OPERATORS

A. General: Equip door with manual door operator by door manufacturer.

B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf (111-N) force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

2.11 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.

2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s): Operator location indicated for each door.

1. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.

1. Electrical Characteristics:

a. Phase: Single phase.

b. Volts: 115 V.

2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.

3. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.

4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-

monitoring feature is activated, door closes only with sustained or constant pressure on close button.

2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

   a. Self-Monitoring Type: Four-wire configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.

3. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.12 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.13 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, application, and baking.

2.14 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.

2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

3. Directional Satin Finish: No. 4.

C. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

D. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Perform installation and startup checks according to manufacturer's written instructions.

2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

1. Adjust exterior doors and components to be weather-resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 08 33 23

DIVISION 08 - OPENINGS
SECTION 08 34 50 - FIBERGLASS REINFORCED PLASTIC DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fiberglass Reinforced Plastic (FRP) Doors and Fiberglass Resin Transfer Molded Door Frames.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.

2. Division 08 Sections "Door Hardware" for door hardware for hollow metal doors and “Glazing”.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings, and finish descriptions for systems compatible with factory primer.

B. Shop Drawings: Include the following:

1. Elevations of each door design.

2. Details of doors, including vertical and horizontal edge details and metal thicknesses.

3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.

4. Locations of reinforcement and preparations for hardware.

5. Details of each different wall opening condition.

6. Details of anchorages, joints, field splices, and connections.

7. Details of accessories.

8. Details of moldings, removable stops, and glazing, if applicable.

C. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

2. Manufacturer's care and maintenance instructions.

3. Color charts for selection of door colors.

1.4 QUALITY ASSURANCE

A. Referenced Standards

1. Door and Frame Assembly

a. ASTM E 152 UL 10(b) NFPA 252

2. Door Properties

a. ASTM C 518 Standard test method for steady for state thermal transmission properties by means of the heat flow meter apparatus.

3. Laminate Properties

a. ASTM D 882 Tensile Strength

b. ASTM D 790 Flexual Strength

c. ASTM D 2583 Barcol Hardness

d. ASTM D 256 Impact Resistance

e. ASTM D 792 Density/Specific Gravity of Laminate

f. ASTM D 1761 Mechanical Fasteners

4. Core properties

a. ASTM C 177 Thermal Properties

b. ASTM D 1622 Density/Specific Gravity

c. ASTM E 84 Surface Burning Characteristics

d. ASTM TM-10 AND TM-5 Fire-stop ASTM E 152 UL 10(b)

e. ASTM – C-36 TYPE X

f. Federal Specification SS-6-30D Type III, Gladex

g. Fire-stop ASTM E 152 UL 10(b)

B. Source Limitations: Obtain work from single source from single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver fiberglass door and frame individually palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

B. Doors shall be stored in the original container on edge out of inclement weather for protection against the elements.

C. Handle doors pursuant to the manufacturer's recommendations as posted on outside of crate.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for fiberglass door and frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.8 WARRANTY

A. Warranty all fiberglass doors and frames for a period of 25 years against failure due to corrosion. Additionally, warranty all fiberglass doors and frames on materials and workmanship for a period of 10 years, including warping, separation or delamination, and expansion of the core.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Corrim Company fiberglass reinforced doors and frames with applicable fire ratings, as noted.

B. Products from other manufacturers will be considered for substitution prior to receipt of bids. Requests for substitution after bids have been received will not be considered. Requests for substitution must include the following information in order to be considered:

1. Formal written request certifying that products to be substituted will match specified products in terms of structural properties, dimensions, physical appearance, quality level, and quantities, and that they will perform the same function in the same manner and will achieve the same end result.

2. Manufacturer's and supplier's material data sheets, specifications, and performance data.

3. A list of three or more projects in satisfactory service for not less than three years that use products identical to those being proposed for substitution. For each project, include name, address, and telephone number of the engineer, the contractor, and the plant manager.

2.2 MATERIALS

A. FRP DOORS

1. Doors shall be made of fiberglass reinforced plastic (FRP) using chemically proven fire-retardant resins resistant to contaminants typically found in the environment for which these specifications are written. Doors shall be 1 3/4 inch thick and of flush construction, having no seams or cracks. All doors up to 4'0 x 8'0 shall have equal diagonal measurements with a maximum tolerance of +/- 1/32 inch.

2. Door Plates shall be molded in one continuous piece, starting with a 25-mil gelcoat of the color specified, integrally molded with at least two layers of 1.5 ounce per square foot fiberglass. Door plate weight shall not be less than 0.97 pounds per square foot with a 30/70 fiberglass to resin.

3. Core material shall be fire resistant mineral core placed within band structure allowing no voids within. Provide insulative core at all exterior doors.

4. Finish of door and frame shall be identical in color and finish. At time of manufacture, 25-mil of resin-rich gelcoat must be integrally molded into both the

door and frame. Secondary painting to achieve color or application of gelcoat is not acceptable.

5. Window openings shall be provided for at time of manufacture and shall be completely sealed so that the interior of the door is not exposed to the environment. Window kits shall be fire rated per U.L. for rating of opening and function.

B. FRP FRAMES

1. Frames shall be fiberglass and manufactured using the resin transfer method in closed rigid molds to assure uniformity in color and size. Frames shall have a minimum of two layers continuous strand fiberglass mat saturated with fire retardant resin. Frames will be of one-piece construction with molded stop. All frame profiles shall have a core of fire-stop and mineral core. Pultruded frames or frames of dissimilar materials, such as metal or stainless steel will not be accepted.

2. Finish of frame shall be identical in color and finish to the door with a minimum 25-mil resin rich gel coat will be integrally molded into the frame at time of manufacture. Secondary painting to achieve color is not acceptable.

3. Jamb/Header connection shall be coped by CNC for tight fit.

4. Internal Reinforcement shall be continuous within the structure to allow for mounting of specified hardware.

5. Mortises for hardware shall be accurately machined by CNC to hold dimensions in all three axis.

6. Hinge pockets shall be accurately machined by CNC to facilitate heavy-duty hinges at all hinge locations, using spacers when standard weight hinges are used.

2.3 COLOR SELECTION

A. Color: The selected color shall pigment both the gel-coat and exterior laminate.

1. Color as selected by the Architect from the manufacturer's full color range.

2.4 FRAME ANCHORS

A. Jamb Anchors:

1. Post-installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prior to installation, adjust and securely brace fiberglass frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90-degrees from jamb perpendicular to frame head.

2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

3.3 INSTALLATION

A. Install door-opening assemblies in accordance with shop drawings and manufacturer’s printed installation instructions, using installation methods and materials specified in installation instructions.

B. Field alteration of doors or frames to accommodate field conditions is strictly prohibited.

C. Fire labeled doors and frames must be installed in strict accordance with manufacturer's instructions and the latest revision of NFPA 80.

D. UL 10(c) Category B doors require field-applied seal per manufacturer's instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including fiberglass work that is warped, bowed, or otherwise unacceptable.

B. Adjust door hardware to operate correctly in accordance with hardware manufacturer's maintenance instructions.

C. Clean surfaces of doors, frames, and hardware in accordance with manufacturer's instructions.

D. Protect door opening assemblies and hardware from damage by subsequent construction activities until final inspection.

END OF SECTION 08 34 50

DIVISION 08 - OPENINGS
SECTION 08 36 13 - SECTIONAL DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Overhead sectional doors, electrically operated.

B. Operating hardware and supports.

C. Electrical controls.

1.2 RELATED REQUIREMENTS

A. Section 13 3400 - Pre-Engineered Building Systems: Door openings.

B. Section 26 05 33.13 - Conduit for Electrical Systems: Conduit from electric circuit to operator and from operator to control station.

C. Section 26 05 33.13 - Conduit for Electrical Systems: Empty conduit from control units to door operator.

1.3 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

E. ITS (DIR) - Directory of Listed Products; Current Edition.

F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

G. NEMA MG 00001 - Motors and Generators; 2024.

H. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

K. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

B. Product Data: Show component construction, anchorage method, and hardware.

C. Samples: Submit two panel finish samples, 6 by 6 inch in size, illustrating color and finish.

D. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.

E. Installer's Qualification Statement.

F. Operation Data: Include normal operation, troubleshooting, and adjusting.

G. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.

H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience.

1. Approved in writing by door manufacturer as qualified to install specified product.

B. Comply with applicable code for motor and motor control requirements.

C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction, as suitable for purpose specified.

1.6 WARRANTY

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Thermospan 200-20 Insulated Sectional Steel Doors manufactured by Wayne Dalton, a Division of Overhead Door Company: www.wayne-dalton.com/#sle.

B. Sectional Doors:

1. Clopay Building Products: Insulated Sandwich Doors, Model 3217: www.clopaydoor.com/#sle.

2. Raynor Garage Doors: ThermaSeal Model TM220: www.raynor.com/#sle.

2.2 STEEL DOORS

A. Steel Doors: Flush steel, insulated; standard lift operating style with track and hardware; complying with DASMA 102, Commercial application.

1. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.

2. Door Nominal Thickness: 2 inches thick.

3. Thermal Transmittance: U-factor of 0.12 BTU/hr sq ft degrees F, maximum, in accordance with DASMA 102.

4. Air Leakage Rate: Less than 0.17 cfm/sq ft when tested in accordance with ASTM E283 at test pressure difference of 1.57 psf.

5. Exterior Finish: Factory finished with standard factory finish; color(s) as selected by Architect from manufacturer's full range of colors.

6. Interior Finish: Factory finished with polyester baked enamel; white color.

7. Electric Operation: Electric control station.

B. Door Panels: Steel construction; outer steel sheet of 20 gauge, 0.0359 inch minimum thickness, flush profile; inner steel sheet of 26 gauge minimum thickness, flat profile; core reinforcement ___ inch sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; polyurethane insulation.

C. Window Frame: Manufacturers standard, finish to match.

D. Glazing: Fully tempered glass; insulated glass units; clear; 1/2 inch overall thickness.

2.3 COMPONENTS

A. Track: Rolled galvanized steel, 0.090 inch minimum thickness; 2 inch wide, continuous one piece per side; galvanized steel mounting brackets 1/4 inch thick.

B. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of stainless steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.

C. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.

D. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

E. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

F. Head Weatherstripping: EPDM rubber seal, one piece full length.

G. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

2.4 MATERIALS

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G60/Z180 coating, plain surface.

B. Float Glass: Provide float glass glazing, unless noted otherwise.

1. Heat-Strengthened and Fully Tempered Types: ASTM C1048.

C. Insulation: Foamed-in-place polyurethane, bonded to facing.

1. R-value of 17.5.

2.5 ELECTRIC OPERATION

A. Electric Operators:

1. Mounting: Side mounted on cross head shaft.

2. Motor Enclosure:

a. Exterior Doors: NEMA MG 00001, Type 4; open drip proof.

3. Motor Rating: 1/2 hp; continuous duty. Larger where size and weight of individual door requires.

4. Motor Voltage: 120 volts, single phase, 60 Hz.

5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.

6. Controller Enclosure: NEMA EN 10250, Type 1.

7. Opening Speed: 12 inches per second.

8. Brake: Adjustable friction clutch type, activated by motor controller.

9. Manual override in case of power failure.

B. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

C. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator complying with UL 325.

1. 24 volt circuit.

2. Surface mounted, at interior door jamb.

3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.

a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

D. Safety Edge: Located at bottom of sectional door panel, full width; electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object; hollow neoprene covered to provide weatherstrip seal.

END OF SECTION 08 36 13

DIVISION 08 - OPENINGS
SECTION 08 41 13 - ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior storefront framing.

2. Storefront framing for punched openings.

B. Related Sections:

1. Division 06 Section "Rough Carpentry".

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.

2. Dimensional tolerances of building frame and other adjacent construction.

3. Failure includes the following:

a. Deflection exceeding specified limits.

b. Thermal stresses transferring to building structure.

c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.

d. Noise or vibration created by wind and by thermal and structural movements.

e. Loosening or weakening of fasteners, attachments, and other components.

f. Sealant failure.

g. Failure of operating units.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Loads:

1. As indicated on Structural Drawings.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.

2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.

2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.

3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

F. Windborne-Debris-Impact-Resistance Performance: Provide aluminum-framed systems that pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 or AAMA 506.

1. Large-Missile Impact: For aluminum-framed systems located within 30 feet of grade.

2. Small-Missile Impact: For aluminum-framed systems located more than 30 feet above grade.

G. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.

H. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

I. Water Penetration under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

1. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.

J. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.

b. Low Exterior Ambient-Air Temperature: 0 deg F.

3. Interior Ambient-Air Temperature: 75 deg F.

K. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.

L. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.57 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

M. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having the following sound-transmission characteristics:

1. Sound Transmission Class (STC): Minimum 26 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.

2. Outdoor-Indoor Transmission Class (OITC): Minimum 26 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Qualification Data: For qualified Installer and testing agency.

E. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

F. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

D. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

E. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

F. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.

b. Noise or vibration caused by thermal movements.

c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

d. Water leakage through fixed glazing and framing areas.

e. Failure of operating components.

2. Warranty Period: Manufacturer’s standard period from date of Substantial Completion.

B. Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: Manufacturer’s standard period from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer North America “TriFab VersaGlaze 451T” or comparable product by one of the following:

1. EFCO Corporation.

2. Vistawall International.

3. YKK AP America Inc.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.

2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.

3. Extruded Structural Pipe and Tubes: ASTM B 429.

4. Structural Profiles: ASTM B 308/B 308M.

5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.

2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.

3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.

2. Glazing System: Retained mechanically with gaskets on four sides.

3. Glazing Plane: As indicated.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.

2. Reinforce members as required to receive fastener threads.

3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding flashing compatible with adjacent materials.

F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.6 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.

2. Accurately fitted joints with ends coped or mitered.

3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.

4. Physical and thermal isolation of glazing from framing members.

5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

6. Provisions for field replacement of glazing from exterior.

7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Storefront Framing: Fabricate components for assembly using shear-block system.

F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: As selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.

2. Do not install damaged components.

3. Fit joints to produce hairline joints free of burrs and distortion.

4. Rigidly secure non-movement joints.

5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.

6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.

2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.

2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.

b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.4 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

END OF SECTION 08 41 13

DIVISION 08 - OPENINGS
SECTION 08 56 59 - SERVICE AND TELLER WINDOW UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Teller drawer.

B. Night depository.

1.2 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood framed wall construction.

B. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 26 05 83 - Wiring Connections: Electrical connection to equipment.

1.3 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate work with adjacent materials specified in other sections and as indicated on drawings and approved shop drawings.

B. Coordinate electrical service and rough-in requirements.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's product data for specified products indicating materials, operation, glazing, finishes, and installation instructions.

B. Shop Drawings: Indicate configuration, sizes, rough-in, mounting, anchors and fasteners, and installation clearances.

C. Samples for Selection of Finishes:

1. Color Anodized Finishes: Submit two samples, 4 inch by 4 inch in size illustrating metal finishes for each finish specified.

D. Installer Qualification Statement.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.

B. Store units in area protected from exposure to weather and vandalism.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Teller Drawer:

1. E. F. Bavis & Associates, Inc., Drive Up

2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Night Depository:

1.

2.2 ASSEMBLY COMPONENTS

A. Windows: Factory-fabricated, finished, and glazed, with extruded aluminum frame and glazing stops; complete with hardware and anchors.

1. Provide window units that are re-glazable from the secure side without dismantling the non-secure side of framing.

2. Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline, and weatherproof. Fully weld corners.

3. Apply factory finish to exposed surfaces.

4. Wind Design: Design and size components to withstand dead loads and live loads caused by pressure and negative wind loads acting normal to plane of window as calculated in accordance with applicable code.

END OF SECTION 08 56 59

DIVISION 08 - OPENINGS
SECTION 08 71 00 - DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Commercial door hardware for the following:

1. Swingiing doors.

2. Other doors to the extent indicated.

B. Cylinders for doors specified in other Sections.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete slab construction.

B. Section 07 9200 - Joint Sealants: For use in setting door thresholds.

C. Section 08 1113 - Hollow Metal Doors and Frames: Astragals and intumescent seals provided as part of fire-rated labeled assemblies and for door silencers provided as part of hollow-metal frames.

D. Section 08 3323 - Overhead Coiling Doors: Door hardware provided as part of overhead door assemblies.

1.3 SUBMITTALS

A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

C. Warranty: Warranty specified in this Section.

D. Other Action Submittals:

1. Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.

1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

2. Installer shall have warehousing facilities in Project's vicinity.

3. Scheduling Responsibility: Preparation of door hardware and keying schedules.

B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

D. Quality Assurance: Fire Rated Door Assemblies to read: Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 as required by NFPA 101.

1. Test Pressure: After 5 minutes into the test, neutral pressure level in furnace shall be established at 40 inches or less above the sill.

E. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." In addition to Owner Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.

2. Preliminary key system schematic diagram.

3. Address for delivery of keys.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.

1.6 COORDINATION

A. Coordinate layout and installation of recessed closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.7 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.

b. Faulty operation of operators and door hardware.

c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Manufacturer’s standard period from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly

preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

PART 2 PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Sets" Article.

C. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 HINGES, GENERAL

A. Quantity: Provide the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to 60 inches.

2. Three Hinges: For doors with heights 61 to 90 inches.

3. Four Hinges: For doors with heights 91 to 120 inches.

4. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

C. Hinge Weight: Unless otherwise indicated, provide the following:

1. Entrance Doors: Heavy-weight hinges.
2. Doors with Closers: Antifriction-bearing hinges.
3. Interior Doors: Standard-weight hinges.

D. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Exterior Hinges: Stainless steel, with stainless-steel pin.
2. Interior Hinges: Steel, with steel pin.
3. Hinges for Fire-Rated Assemblies: Steel, with steel pin.

E. Hinge Options: Where indicated in door hardware sets or on Drawings:

1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for outswinging exterior doors and outswinging corridor doors with locks.
2. Corners: Square.

F. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Phillips flat-head; Finish screw heads to match surface of hinges.

2.3 HINGES

A. Butts and Hinges: BHMA A156.1. Listed under Category A in BHMA's "Certified Product Directory."

B. Template Hinge Dimensions: BHMA A156.7.

C. Manufacturers:

1. Hager Companies (HAG).
2. McKinney Products Company; an ASSA ABLOY Group company (MCK).
3. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

2.4 LOCKS AND LATCHES, GENERAL

A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and ANSI A117.1.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

C. Lock Trim:

1. Levers: Forged.

a. Schlage “Saturn.”

2. Escutcheons (Roses): Forged.

D. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Mortise Locks: Minimum 3/4-inch latchbolt throw.

E. Rabbeted Meeting Doors: Provide special rabbeted front and strike on locksets for rabbeted meeting stiles.

F. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.

2. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

3. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.

4. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.

2.5 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:

1. Bored Locks: BHMA A156.2.

2. Mortise Locks: BHMA A156.13.

3. Interconnected Locks: BHMA A156.12.

B. Mortise Locks: Stamped steel case with steel or brass parts; BHMA A156.13, Grade 1 unless Grade 2 is indicated; Series 1000. Listed under Category F in BHMA's "Certified Product Directory."

1. Manufacturers:

a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).

b. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).

c. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).

d. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).

2.6 DOOR BOLTS

A. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Half-Round Surface Bolts: Minimum 7/8-inch throw.

2. Interlocking Surface Bolts: Minimum 15/16-inch throw.

3. Fire-Rated Surface Bolts: Minimum 1-inch throw; listed and labeled for fire-rated doors.

4. Dutch-Door Bolts: Minimum 3/4-inch throw.

5. Mortise Flush Bolts: Minimum 3/4-inch throw.

B. Dustproof Strikes: BHMA A156.16, Grade 1.

C. Surface Bolts: BHMA A156.16, Grade 1 unless Grade 2 is indicated.

1. Flush Bolt Heads: Minimum of 1/2-inch- diameter rods of brass, bronze, or stainless steel with minimum 12-inch- long rod for doors up to 84 inches in height. Provide longer rods as necessary for doors exceeding 84 inches.

2. Manufacturers:

   a. Glynn-Johnson; an Ingersoll-Rand Company (GJ).

   b. Hager Companies (HAG).

   c. IVES Hardware; an Ingersoll-Rand Company (IVS).

   d. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

D. Manual Flush Bolts: BHMA A156.16, Grade 1 unless Grade 2 is indicated; designed for mortising into door edge.

1. Manufacturers:

   a. Glynn-Johnson; an Ingersoll-Rand Company (GJ).

   b. Hager Companies (HAG).

   c. IVES Hardware; an Ingersoll-Rand Company (IVS).

   d. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

2.7 EXIT DEVICES

A. Exit Devices: BHMA A156.3, Grade 1 unless Grade 2 is indicated. Listed under Category G in BHMA's "Certified Product Directory."

B. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and ANSI A117.1.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

C. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

E. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

F. Outside Trim: Match design for locksets and latchsets, unless otherwise indicated.

G. Through Bolts: For exit devices and trim

H. Manufacturers:

1. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).

2. DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).

3. Dor-O-Matic; an Ingersoll-Rand Company (DOR).

4. Von Duprin; an Ingersoll-Rand Company (VD).

2.8 LOCK CYLINDERS

A. Standard Lock Cylinders: BHMA A156.5, Grade 1 unless Grade 1A is indicated.

B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:

1. Number of Pins: Six.

2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.

C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:

1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.

D. Construction Keying: Comply with the following:

1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

a. Replace construction cores with permanent cores as indicated in keying schedule.

E. Manufacturers:

1. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).

2. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).

3. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).

4. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).

2.9 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference, and as follows:

1. Existing System: Master key or grand master key locks to Owner's existing system.

B. Keys: Nickel silver.

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

a. Notation: Information to be furnished by Owner.

2. Quantity: In addition to one extra key blank for each lock, provide the following:

a. Cylinder Change Keys: Three.

b. Master Keys: Five.

c. Grand Master Keys: Five.

2.10 OPERATING TRIM

A. Standard: BHMA A156.6.

B. Manufacturers:

1. Hager Companies (HAG).

2. Hiawatha, Inc. (HIA).

3. IVES Hardware; an Ingersoll-Rand Company (IVS).

4. Rockwood Manufacturing Company (RM).

2.11 CLOSERS

A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and ANSI A117.1.

1. Comply with the following maximum opening-force requirements:

a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.

b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.

C. Flush Floor Plates: Provide finish cover plates for floor closers unless thresholds are indicated. Match door hardware finish, unless otherwise indicated.

D. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

E. Surface Closers: BHMA A156.4, Grade 1 unless Grade 2 is indicated. Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.

1. Manufacturers:

a. DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).

b. LCN Closers; an Ingersoll-Rand Company (LCN).

c. Norton Door Controls; an ASSA ABLOY Group company (NDC).

d. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).

F. Closer Holder Release Devices: BHMA A156.15. Listed under Category C in BHMA's "Certified Product Directory."

1. Manufacturers:

a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).

b. DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).

c. LCN Closers; an Ingersoll-Rand Company (LCN).

d. Norton Door Controls; an ASSA ABLOY Group company (NDC).

e. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).

G. Coordinators: BHMA A156.3.

2.12 PROTECTIVE TRIM UNITS

A. Size: 1-1/2 inches less than door width on push side and 1/2 inch less than door width on pull side, by height specified in door hardware sets.

B. Fasteners: Manufacturer's standard machine or self-tapping screws.

C. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from the following material:

1. Material: 0.050-inch- thick stainless steel.

2. Manufacturers:

a. Hiawatha, Inc. (HIA).

b. IVES Hardware; an Ingersoll-Rand Company (IVS).

c. Rockwood Manufacturing Company (RM).

2.13 STOPS AND HOLDERS

A. Stops and Bumpers: BHMA A156.16, Grade 1 unless Grade 2 is indicated.

1. Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.

B. Mechanical Door Holders: BHMA A156.16, Grade 1 unless Grade 2 is indicated.

C. Combination Overhead Stops and Holders: BHMA A156.8, Grade 1 unless Grade 2 is indicated.

D. Silencers for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 1/2 inch; fabricated for drilled-in application to frame.

E. Manufacturers:

1. Glynn-Johnson; an Ingersoll-Rand Company (GJ).

2. Hager Companies (HAG).

3. IVES Hardware; an Ingersoll-Rand Company (IVS).

4. Rockwood Manufacturing Company (RM).

5. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

2.14 DOOR GASKETING

A. Standard: BHMA A156.22. Listed under Category J in BHMA's "Certified Product Directory."

B. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

C. Air Leakage: Not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.

D. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.

1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.

E. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

F. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

G. Gasketing Materials: ASTM D 2000 and AAMA 701/702.

H. Manufacturers:

1. National Guard Products (NGP).

2. Pemko Manufacturing Co. (PEM).

3. Sealeze; a unit of Jason Incorporated (SEL).

4. Zero International (ZRO).

2.15 THRESHOLDS

A. Standard: BHMA A156.21. Listed under Category J in BHMA's "Certified Product Directory."

B. Accessibility Requirements: Where thresholds are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and ANSI A117.1.

1. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.

C. Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 1/2 inch high.

D. Manufacturers:

1. National Guard Products (NGP).

2. Pemko Manufacturing Co. (PEM).

3. Reese Enterprises (RE).

4. Zero International (ZRO).

2.16 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Steel Machine or Wood Screws: For the following fire-rated applications:

a. Mortise hinges to doors.

b. Strike plates to frames.

c. Closers to doors and frames.

3. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:

a. Surface hinges to doors.

b. Closers to doors and frames.

c. Surface-mounted exit devices.

4. Spacers or Sex Bolts: For through bolting of hollow-metal doors.

2.17 FINISHES

A. Standard: BHMA A156.18, as indicated in door hardware sets.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 Series.

1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.8 DOOR HARDWARE SETS

A. Furnish and install hardware conforming to project specifications in sets according to the following schedule.

1. HARDWARE SET 01: Standard Exterior Single Door:

Each to Have:

	Hinges	Hager BB1199NRP	US32D
1	Exit Device	Von Duprin 99NL	US26D
1	Cylinder	Schlage 20-022	
1	Closer	LCN 4111 HCUSH (Rust Inhib.)	AL
1	Kickplate	Hager 190S 12x Width	US32D
1	Threshold	Pemko 171A	Mill Finish
1	Door Bottom	Pemko 315CN	Mill Finish
	Weatherstrip	Pemko S88D	

2. HARDWARE SET 02: Standard Interior Door - Panic/Conditioned:

Each to Have:

	Hinges	Hager BB1199NRP	US32D
1	Exit Device	Von Duprin 99NL	US26D
1	Cylinder	Schlage 20-022	
1	Closer	LCN 4111 HCUSH (Rust Inhib.)	AL
1	Kickplate	Hager 190S 12x Width	US32D
1	Door Bottom	Pemko 315CN	Mill Finish
	Weatherstrip	Pemko S88D	

3. HARDWARE SET 03: Standard Interior Double-Doors - Panic/Conditioned:

Each to Have:

	Hinges	Hager BB1199NRP	US32D
1	Flushbolt	Hager 282D	US26D
1	Exit Device	Von Duprin 9975NL	US26D
1	Cylinder	Schlage 20-001	
2	Closer	LCN 4111 HCUSH (Rust Inhib.)	AL
2	Kickplate	Hager 190S 12x Width	US32D
1	Threshold	Pemko 171A	Mill Finish
2	Door Bottom	Pemko 315CN	Mill Finish
	Weatherstrip	Pemko S88D	

4. HARDWARE SET 04: Standard Exterior Single-Door - Storeroom:

Each to Have:

	Hinges	Hager BB1199NRP	US32D
1	Lockset	Schlage – Storeroom AL80PD	626
1	Closer	LCN 4111 HCUSH (Rust Inhib.)	AL
1	Kickplate	Hager 190S 12x Width	US32D

1	Threshold	Pemko 171A	Mill Finish
1	Door Bottom	Pemko 315CN	Mill Finish
	Weatherstrip	Pemko S88D	

5. HARDWARE SET 05: Standard Exterior Double-Doors - Storeroom:

Each to Have:

	Hinges	Hager BB1199NRP	US32D
1	Flushbolt	Hager 282D	US26D
1	Lockset	Schlage – Storeroom AL80PD	626
1	Cylinder	Schlage 20-001	
2	Closer	LCN 4111 HCUSH (Rust Inhib.)	AL
2	Kickplate	Hager 190S 12x Width	US32D
1	Threshold	Pemko 171A	Mill Finish
2	Door Bottom	Pemko 315CN	Mill Finish
	Weatherstrip	Pemko S88D	

6. HARDWARE SET 06: Standard Interior Double-Doors - Storeroom:

Each to Have:

	Hinges	Hager BB1199NRP	US32D
1	Flushbolt	Hager 282D	US26D
1	Lockset	Schlage – Storeroom AL80PD	626
1	Cylinder	Schlage 20-001	
2	Overhead Stop	Glynn-Johnson 100 Series	US32D

7. HARDWARE SET 07: Standard Interior Single Door - Passage:

Each to Have:

	Hinges	Hager BB1119	US32D

1	Lockset	Schlage – Passage AL10S	626
1	Closer	LCN 4111 CUSH	AL
1	Kickplate	Hager 190S 12x Width	US32D
	Weatherstrip	Pemko S88D Kickplate	

8. HARDWARE SET 08: Standard Interior Single-Door - Panic Hardware:

   Each to Have:

	Hinges	Hager BB1199	US32D
1	Exit Device	Von Duprin 99NL	US32D
1	Closer	LCN 4111 CUSH	AL
1	Kickplate	Hager 190S 12x Width	US32D

9. HARDWARE SET 09: Standard Interior Single-Door - Office:

   Each to Have:

	Hinges	Hager BB1119	US32D
1	Lockset	Schlage – Office AL50PD	626
1	Closer	LCN 4111 CUSH	AL
1	Stop	Hager 236W	US32D

10. HARDWARE SET 10: Standard Interior Single-Door - Office:

    Each to Have:

	Hinges	Hager BB1119	US32D
1	Lockset	Schlage – Office AL50PD	626
1	Closer	LCN 4111 CUSH	AL

11. HARDWARE SET 11: Standard Interior Single-Door - Secure:

    Each to Have:

	Hinges	Hager BB1119NRP	US32D

1	Lockset	Schlage – Classroom AL70PD	626
1	Stop	Hager 236W	US32D

12. HARDWARE SET 12: Standard Interior Single-Door - Secure:

Each to Have:

	Hinges	Hager BB1119NRP	US32D
1	Lockset	Schlage – Classroom AL70PD	626
1	Overhead Stop	Glynn-Johnson 100 Series	US32D

13. HARDWARE SET 13: Standard Interior Single-Door - Passage:

Each to Have:

	Hinges	Hager BB1119	US32D
1	Lockset	Schlage – Passage AL10S	626
1	Closer	LCN 4111 CUSH	AL
1	Stop	Hager 236W	US32D

14. HARDWARE SET 14: Standard Interior Single-Door - Passage:

Each to Have:

	Hinges	Hager BB1119	US32D
1	Lockset	Schlage – Passage AL10S	626
1	Overhead Stop	Glynn-Johnson 100 Series	US32D

15. HARDWARE SET 15: Standard Interior Single-Door - Bathroom:

Each to Have:

	Hinges	Hager BB1279	US32D
1	Lockset	Schlage – Privacy AL40S	626

1	Closer	LCN 4111 CUSH	AL
1	Kickplate	Hager 190S 12x Width	US32D
1	Stop	Hager 236W	US32D

16. HARDWARE SET 16: Standard Interior Single-Door - Bathroom:

Each to Have:

	Hinges	Hager BB1279	US32D
1	Push/Pull	Hager – 33E-4x16	US32D
1	Closer	LCN 4111 CUSH	AL
1	Kickplate	Hager 190S 12x Width	US32D
1	Stop	Hager 236W	US32D

END OF SECTION 08 71 00

DIVISION 08 - OPENINGS
SECTION 08 80 00 - GLAZING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.

2. Storefront framing.

3. Hole and backer voice ports at reception counter glazing between Waiting 101 and Reception 102.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 and ICC's 2006 International Building Code by a qualified professional engineer, using the following design criteria:

1. Design Wind Pressures: As indicated on Drawings.

2. Design Snow Loads: As indicated on Drawings.

3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.

4. Glass Type Factors for Wired, Patterned, and Sandblasted Glass:

   a. Short-Duration Glass Type Factor for Wired Glass: 0.5.

   b. Long-Duration Glass Type Factor for Wired Glass: 0.3.

   c. Short-Duration Glass Type Factor for Patterned Glass: 1.0.

   d. Long-Duration Glass Type Factor for Patterned Glass: 0.6.

   e. Short-Duration Glass Type Factor for Sandblasted Glass: 0.5.

5. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.

6. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.

3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.

4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.6 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers, manufacturers of insulating-glass units with sputter-coated, low-e coatings glass testing agency and sealant testing agency.

B. Product Certificates: For glass and glazing products, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass coated glass insulating glass glazing sealants and glazing gaskets.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Warranties: Sample of special warranties.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

E. Source Limitations for Glass: Obtain tinted float glass coated float glass laminated glass and insulating glass from single source from single manufacturer for each glass type.

F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."

2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."

3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."

4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

I. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.

J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.11 WARRANTY

A. Manufacturer's Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: Manufacturer’s standard period from date of Substantial Completion.

B. Manufacturer's Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: Manufacturer’s standard period from date of Substantial Completion.

C. Manufacturer's Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure

of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: Manufacturer’s standard period from date of Substantial Completion.

PART 2 PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.

2. For laminated-glass lites, properties are based on products of construction indicated.

3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.

4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.

5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.

6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 MANUFACTURERS

A. In other Part 2 Articles where titles below introduce lists, the following requirements apply to product selection:

1. Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or equal by a preapproved manufacturer.

2.3 GLASS PRODUCTS

A. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2. For uncoated glass, comply with requirements for Condition A.

3. For coated vision glass, comply with requirements for Condition C (other coated glass).

2.4 LAMINATED GLASS

A. Laminated Glass (clear): ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Kind FT (fully tempered)

2. Clear polyvinyl butyral interlayer

3. Kind FT (fully tempered)

4. Interlayer Thickness: As needed to comply with requirements.

5. Interlayer Color: Clear/Cool White unless otherwise indicated.

B. Laminated Glass (privacy): ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Kind FT (fully tempered)
2. Clear polyvinyl butyral interlayer
3. Cool White polyvinyl butyral interlayer
4. Kind FT (fully tempered)
5. Interlayer Thickness: As needed to comply with requirements.
6. Interlayer Color: Clear/Cool White unless otherwise indicated.

2.5 INSULATING GLASS

A. Solar-Control Low-E Insulating-glass Units:

1. Basis-of-Design Product: Viracon Radiant Low-E: VRE 7-59.
2. Overall Unit Thickness: 1 inch.
3. Thickness of Each Lite: 6.0 mm.
4. Outdoor Lite: Azuria VRE-59 #2; Fully Tempered.
5. Interspace Content: Argon.
6. Indoor Lite: Clear Float Glass; Fully Tempered.
7. Low-e Coating: Sputtered on second surface.
8. Visible Light Transmittance: 41 percent minimum.
9. Reflectance: Visible Light-Exterior: 20 percent minimum.
10. Winter U-Value: 0.26 maximum.
11. Summer U-Value: 0.22 maximum.
12. Shading Coefficient: 0.25 maximum.
13. Solar Heat Gain Coefficient: 0.22 maximum.

B. Ceramic-Coated Spandrel Insulating-Glass Units:

1. Construction: Provide units that comply with requirements specified for insulating-glass units designated above.

a. Kind HS (heat strengthened)

b. Ceramic Coating Location Third Surface

c. Color: To be selected from manufacturer's full range.

2.6 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from the following:

1. Neoprene complying with ASTM C 864.

2. EPDM complying with ASTM C 864.

3. Silicone complying with ASTM C 1115.

4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM, silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.7 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

4. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

5. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Uses related to glazing substrates: M, G, A and as applicable to glazing substrates indicated, O.

a. Use O Glazing Sub-startes: Coated Glass.

C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.8 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.

2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.

2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Hole and Backer Voice Port:

1. Basis of Design: Total Security Solutions, Inc., www.tssbulletproof.com/#sle.

2. Configuration: Round, 1 inch spacing between window glass and oversized backer.

3. Location(s) in glass unit(s): As shown on drawings.

4. Size: 6 inch diameter hole with 10 inch diameter oversized backer located on the Reception 102 side of the glazing.

5. Glazing: 3/4 inch laminated glass assembly with polished edges at voice port opening(s). Coordinate glass thickness requirements with voice port attachment device requirements.

6. Attachment devices: As recommended by voice port manufacturer. Finished caps, acorn nuts shall be chrome plated.

C. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

D. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

E. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

F. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

G. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

H. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.10 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners, including bottom edge of 3/4 inch laminated glass unit(s) routed into solid surface counter top.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.

2. Presence and functioning of weep systems.

3. Minimum required face and edge clearances.

4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

1. Where a sealant cap bead is shown or specified, position tapes below top of fixed stops to allow space for sealant and tooling.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings (other than at solid surface counter top) on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.8 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08 80 00

DIVISION 09 - FINISHES
SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal channel ceiling framing.

C. Metal channel, furring ceiling framing.

D. Acoustic insulation.

E. Gypsum sheathing.

F. Gypsum wallboard.

G. Joint treatment and accessories.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Building framing and exterior sheathing.

B. Section 07 21 00 - Thermal Insulation: Thermal insulation.

C. Section 07 9200 - Joint Sealants.

D. Section 09 9123 - Interior Painting.

1.3 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Framing - Nonstructural Members; 2015.

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015.

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

E. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2011a (Reapproved 2015).

F. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.

G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2017.

H. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2017a.

I. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2016.

J. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.

K. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

L. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

M. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

N. ASTM E413 - Classification for Rating Sound Insulation; 2016.

O. GA-216 - Application and Finishing of Gypsum Board; 2016.

P. GA-600 - Fire Resistance Design Manual; 2015.

Q. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

R. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; 2016, with Editorial Revision (2021).

1.4 SUBMITTALS

A. Product Data:

1. Provide data on gypsum board, accessories, and joint finishing system.

2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.5 Delivery, Storage, and Handling

A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic by incorporating sound attenuation batt insulation: Provide completed assemblies with the following characteristics:

1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions in accordance with ASCE 7 for Seismic Design Category D, E, or F and complying with the following:

1. Local authorities having jurisdiction.

2.2 METAL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.

B. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.

1. Ceiling Channels: C-shaped.

2. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.

2.3 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:

1. American Gypsum Company: www.americangypsum.com/#sle.

2. CertainTeed Corporation: www.certainteed.com/#sle.

3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.

4. Gold Bond Building Products, LLC provided by National Gypsum Company : www.goldbondbuilding.com/#sle.

5. USG Corporation: www.usg.com/#sle.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut; edges tapered.

1. Application: Use for vertical surfaces, unless otherwise indicated.

2. Type: Fire-resistance-rated Type X, Ul listed.

3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.

b. Mold resistant board is required at all wet locations or as otherwise noted on the drawings.

4. Thickness:

a. Vertical Surfaces: 5/8 inch.

C. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Ceilings, unless otherwise indicated.

2. Thickness: 5/8 inch.

3. Edges: Tapered.

2.4 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness shown on drawings.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.

2. Joint Compound: Setting type, field-mixed.

E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C1007AISI S220 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.

1. Level ceiling system to a tolerance of 1/1200.

2. Laterally brace entire suspension system.

C. Standard Wall Furring: Install at masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.

1. Orientation: Horizontal.

2. Spacing: As indicated; where not indicated, place a maximum 24 inches on center.

3.3 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.4 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

3.5 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:

1. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

1. Feather coats of joint compound so that camber is maximum 1/32 inch.

END OF SECTION 09 21 16

DIVISION 09 - FINISHES
SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Acoustical ceiling panels.

B. Exposed suspension systems for ceilings.

1.2 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wall construction, miscellaneous framing and concealed blocking.

B. Section 06 1753 - Shop-Fabricated Wood Trusses: Roof Structure.

C. Section 06 6400 - Plastic Paneling: Fiber Reinforced Panel Ceiling Construction: Fiber Reinforced Ceiling (FRP) Ceilings.

D. Section 09 2116 - Gypsum Board Assemblies: Gypsum Board.

1.3 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

1.4 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most recent Edition Cited by Referring Code or Reference Standard.

B. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process; 2022.

C. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.

D. ASTM C635 - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

E. ASTM 636 - Standard Practice for Installation of Metal Ceiling Suspension Systems fo Acoustical Tile and Lay-In Panels; 2019.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

G. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

H. ASTM E580 - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Subject to Earthquake Ground Motions; 2022.

I. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

J. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.

2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following components are shown and coordinated with each other, using the input and information from the installers of the copmponents involved:

1. Suspended ceiling system components including perimeter moldings.

2. Structural members to which suspension systems will be attached.

3. Items penetrating the finished ceiling system including the following, as applicable:

a. Lighting fixtures.

b. Air inlets and outlets.

c. Fire alarm system components.

d. Computer related system components.

e. Sprinklers.

f. Speakers.

1.6 QUALITY ASSURANCE

A. Source Limitations:

1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer for entire project.

2. Suspension System: Obtain each type through one source from a single manufacturer for entire project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling panels carefully to avoid chipping edges or damaging units in any way.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.9 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.10 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 2 boxes.

2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.

PART 2 PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING: TYPE 1

A. Basis-of-Design Product: Armstrong World Industries, Inc.; Dune Tegular, 1775 or a comparable product by one of the following:

1. Equivalent products of other manufacturers. Architect will be final judge as to whether proposed products of other manufacturers are equivalent in quality and aesthetics.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Pattern: E (lightly textured).

2. Color: White

3. LR: Not less than 0.83

4. NRC: Not less than 0.50

5. CAC: Not less than 35

6. Edge/Joint Detail: Beveled Tegular

7. Thickness: 5/8 inch

C. Modular Size: 24 by 24 inches.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- diameter wire.

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING:

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong – Silhouette XL 1/4-inch Reveal, 9/16” Exposed Tee or a comparable product by one of the following:

1. Equivalent products of other manufacturers. Architect will be final judge as to whether proposed products of other manufacturers are equivalent in quality and aesthetics.

B. Wide-Face, Capped, Double-Web,Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 9/16-inch- wide metal caps on flanges.

1. Structural Classification: Heavy-duty system.

2. End Condition of Cross Runners: Override (stepped) type.

3. Face Design: ¼-inch reveal.

4. Cap Material: Steel or aluminum cold-rolled sheet.

5. Cap Finish: Painted white.

2.5 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

6. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet . Miter corners accurately and connect securely.

3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.

2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

3. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.

4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

DIVISION 09 - FINISHES
SECTION 09 65 00 - RESILIENT FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

B. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.3 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2017.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2013a.

D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2016.

E. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

F. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Verification Samples: Submit two samples, 6 by 6 inch in size illustrating color and pattern for each resilient flooring product specified.

E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Flooring Material: 5% of overall product used of each type and color.

3. Extra Wall Base: 5% of overall product used of each type and color.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.7 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.1 TILE FLOORING

A. Vinyl Tile - LVT-1 & LVT-2: Printed film type, with transparent or translucent wear layer.

1. Manufacturers:

a. Substitutions: See Section 01 60 00 - Product Requirements.

2. Minimum Requirements: Comply with ASTM F1700, Class III.

3. Square Tile Size: As indicated on drawings.

4. Plank Tile Size: As indicated on drawings.

5. Wear Layer Thickness: 22 mil.

6. Total Thickness: 4.5 mm.

7. Color: As indicated on drawings.

2.2 RESILIENT BASE

A. Resilient Base - Type RB-1: ASTM F1861, Type TV, vinyl, thermoplastic; style as scheduled.

1. Manufacturers:

a. Johnsonite, a Tarkett Company; _____: www.johnsonite.com/#sle.

2. Height: 4 inches.

3. Thickness: 0.125 inch.

4. Finish: Satin.

5. Length: Roll.

6. Color: As indicated on drawings.

7. Accessories: Premolded external corners and internal corners.

2.3 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Moldings, Transition and Edge Strips: Same as base.

D. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).

1. Test as Follows:

a. Alkalinity (pH): ASTM F710.

b. Internal Relative Humidity: ASTM F2170.

c. Moisture Vapor Emission: ASTM F1869.

2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

3.3 Installation - General

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

3.4 Installation - Tile Flooring

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

3.5 Installation - Resilient Base

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.6 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.7 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION 09 65 00

DIVISION 09 - FINISHES
SECTION 09 68 13 - TILE CARPETING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

B. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.3 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.

D. CRI 104 - Standard for Installation of Commercial Carpet; 2015.

E. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

G. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.6 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Tile Carpeting:

1. Interface, Inc: www.interface.com/#sle.

2. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 MATERIALS

A. Tile Carpeting, Type CPT-1 & CPT-2: Tufted textured loop, manufactured in one color dye lot.

1. Size: 25cm x 1m

2. Color: as indicated on drawings.

3. Pattern: as indicated on drawings.

4. Yarn Manufacturer: Aquafil.

5. Dye Method: 100% solution dyed.

6. Tufted Yarn Weight: 19oz/square yard

7. Stitches: 8.5 per inch.

B. Tile Carpeting, Type CPT-3: Tufted textured loop, manufactured in one color dye lot.

1. Size: 50cm x 50cm

2. Color: as indicated on drawings.

3. Pattern: as indicated on drawings.

4. Yarn Manufacturer: Aquafil.

5. Dye Method: 100% solution dyed.

6. Tufted Yarn Weight: 26oz/square yard

7. Pile Height: 0.2 inch

8. Stitches: 10 per inch.

2.3 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Vinyl, _____ color.

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).

1. Test as Follows:
    a. Alkalinity (pH): ASTM F710.
    b. Internal Relative Humidity: ASTM F2170.
    c. Moisture Vapor Emission: ASTM F1869.
2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.2 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

D. Vacuum clean substrate.

3.3 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Locate change of color or pattern between rooms under door centerline.

G. Fully adhere carpet tile to substrate.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.4 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION 09 68 13

DIVISION 09 - FINISHES
SECTION 09 91 23 - INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

1. Where electrical panels are installed prior to painting, paint visible areas and edges of plywood communications and electrical room mounting boards.

2. Mechanical and Electrical:

a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.

b. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.

c. Paint dampers exposed behind louvers, grilles, to match face panels.

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.

2. Items indicated to receive other finishes.

3. Items indicated to remain unfinished.

4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.

5. Floors, unless specifically indicated.

6. Glass.

7. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

A. Section 042000 - Unit Masonry: Concrete masonry walls.

B. Section 042300 - Glass Unit Masonry: Glass masonry panels.

C. Section 051200 - Structural Steel Framing: Shop-primed members.

D. Section 05 50 00 - Metal Fabrications: Shop-primed items.

E. Section 061000 - Rough Carpentry: Communications and electrical room mounting boards.

F. Section 081113 - Hollow Metal Doors and Frames: Factory primed finish.

G. Section 092116 - Gypsum Board Assemblies.

H. Section 099600 - High-Performance Coatings.

I. Section 133419 - Metal Building Systems: Metal primer, finish used for field finished surfaces.

1.3 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

D. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.4 SUBMITTALS

A. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").

2. MPI product number (e.g., MPI #47).

B. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.

1. Where sheen is specified, submit samples in only that sheen.

C. Certification: By manufacturer that paints and finishes comply with VOC limits specified or otherwise required by state in which project is located.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Provide paints and finishes from the same manufacturer to the greatest extent possible.

1. If a single manufacturer cannot provide specified products; minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

C. Paints:

1. Basis of Design:

a. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Supply each paint material in quantity required to complete entire project's work from a single production run.

3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes that comply with the most stringent requirements specified in the following:

a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.

b. Architectural coatings VOC limits of the State in which the Project is located.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

2.3 PAINT SYSTEMS - INTERIOR

A. Paint MI-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:

1. Touch-up with alkyd primer.

B. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:

1. One coat of alkyd primer sealer.

C. Paint I-TR-F - Fire-Retardant Coating, Intumescent:

1. One coat of fire-retardant primer sealer.

2. Gloss: One coat of intumescent coating, flame/smoke rating of 25/50; _____ manufactured by _____.

2.4 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

2.5 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:

1. Gypsum Wallboard: 12 percent.

2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Masonry:

1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.

2. Prepare surface as recommended by prime coat and top coat manufacturer.

G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

H. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

2. Prepare surface according to SSPC-SP 2.

I. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Re-prime entire shop-primed item.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Sand metal surfaces lightly between coats to achieve required finish.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes just prior to Substantial Completion.

3.6 SCHEDULE - PAINT SYSTEMS

A. Concrete Masonry Units (CMU): Finish surfaces exposed to view.

1. Prime Coat:

a. Sherwin-Williams, Loxon Concrete and Masonry Primer/Sealer - Interior/Exterior Latex.

2. Two Finish Coats:

a. Sherwin-Willimas, A12W151 A-100 Exterior Latex, Low Sheen.

B. Gypsum Board: Finish surfaces exposed to view.

1. Interior Walls and Vertical Fascia Surface(s):
    a. Prime Coat(s): Primer, Sealer, Latex.
        1) Sherwin-Williams, ProMar 200 Zero VOC Interior Latex Primer.
    b. Intermediate Coat: Latex, Interior matching topcoat.
    c. Top Coat: Latex, Interior Eggshell, Gloss Level 3.
        1) Sherwin-Williams, ProMar 200 Zero VOC Interior Latex.
    d. Wall Location(s): General wall use, U.N.O.
        1) At Toilet Rooms (Mens 104 and Womens 105) and Janitor 115, provide Semi-Gloss sheen.
2. Interior Ceilings and Underside of Soffit(s):
    a. Prime Coat(s): Primer Sealer, Latex.
        1) Sherwin-Williams, ProMar 200 Zero VOC Interior Latex Primer.
    b. Intermediate Coat: Latex, Interior matching topcoat.
    c. Top Coat: Latex, Interior Flat, Gloss Level 1.
        1) Sherwin-Williams, ProMar 200 Zero VOC Interior Latex Flat.

C. Masonry Walls: Finish surfaces exposed to view.
    1. Prime Coat: As needed to fill voids and provide continuous surface
        a. Sherwin-Williams, Pro Industrial Heavy Duty Block Filler
    2. Finish Coats:
        a. Sherwin Williams, Pro Industrial Waterbased Catalyzed Epoxy, Semi-Gloss

D. Interior Hollow Metal Doors and Frames: Finish both faces and both vertical edges.
    1. Prime Coat: Field prime all shop primed hollow metal doors and frames.
        a. Sherwin-Williams, Pro Industrial Pro-Cryl Universal Metal Primer, B66-310 Series.
    2. Intermediate Coat: Matching Topcoat

3. Finish Coat:

a. Sherwin Williams, Pro Industrial Water-based Alkyd Urethane, Semi-Gloss

3.7 COLOR SCHEDULE

A. See drawings.

END OF SECTION 09 91 23

DIVISION 09 - FINISHES
SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. High performance coatings.

B. Surface preparation.

1.2 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Exposed portions of exterior galvanized lintels and other exposed exterior metal fabrications.

B. Section 08 1113 - Hollow Metal Doors and Frames: Exterior hollow metal door(s) and frame(s).

C. Section 09 9123 - Interior Painting.

1.3 REFERENCE STANDARDS

A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

D. SSPC-SP 2 - Hand Tool Cleaning; 2018.

E. SSPC-SP 3 - Power Tool Cleaning; 2018.

F. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide complete list of all products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").

2. MPI product number (e.g. MPI #47).

3. Cross-reference to specified coating system(s) product is to be used in; include description of each system.

4. Manufacturer's installation instructions.

C. Samples: Submit two samples 8 by 8 inch in size illustrating colors available for selection.

D. Manufacturer's Certificate: Certify that high-performance coatings comply with VOC limits specified.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.6 FIELD CONDITIONS

A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the coating product manufacturer.

C. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.

D. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

E. Restrict traffic from area where coating is being applied or is curing.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. High-Performance Coatings:

1. PPG Paints: www.ppgpaints.com/#sle.

2. Precision Coatings: www.precisioncoatingsinc.com/#sle.

3. Tnemec Company, Inc: www.tnemec.com/#sle.

2.2 HIGH-PERFORMANCE COATINGS

A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in MPI Approved Products List.

2.3 TOP COAT MATERIALS

A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.

B. Urethane Coating: For exterior galvanized metal including exterior and interior surfaces of exterior hollow metal door(s) and frame(s), exposed structural steel lintels and steel bollards.

1. Number of Coats: Two.

2. Top Coat(s): Polyurethane, Two-Component; MPI #72, #174.

a. Sheen: Semi-Gloss.

b. Products:

1) Pittsburgh Paints; Pitthane High Build Urethane Enamel, 95-8800 Series, Semi-Gloss: www.ppgpaints.com/#sle.

2) Precision Coatings; PC3 Acrylic Polyurethane Topcoat: www.precisioncoatingsinc.com/#sle.

3) Tnemec Company, Inc; Series 1095 Endura-Shield: www.tnemec.com/#sle.

3. Primer: As recommended by coating manufacturer for specific substrate.

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Provide sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Do not begin application of coatings until substrates have been properly prepared.

C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

F. Test shop-applied primer for compatibility with subsequent field applied primer. Apply field applied primer as bond coat to shop applied primer.

3.2 PREPARATION

A. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

B. Clean surfaces of loose foreign matter.

C. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.

D. Remove finish hardware, and accessories and store.

E. Do not paint door and frame fire rating labels.

F. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

2. Prepare surface according to SSPC-SP 2.

G. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning", and protect from corrosion until coated.

3.3 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.4 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in MPI - Architectural Painting and Specification Manual.

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.5 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.6 PROTECTION

A. Protect finished work from damage.

END OF SECTION 09 96 00

DIVISION 9 - FINISHES
SECTION 09 96 57 - STEEL GROUND STORAGE TANK PAINTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces. This section may be applied to the ground storage tank at the sole discretion of the Engineer and will be furnished and installed complete in place as part of the main bid.

B. Work in this section includes:

1. Shop surface preparation,
2. Field surface preparation,
3. Shop prime coating of surfaces,
4. Paint interior wet and dry surfaces of tank,
5. Paint exterior surfaces of tank, including foundation to finished grade,
6. Sterilization and filling of the tank, and
7. Worker protection.
8. Paint piping within the tank including draft tube.

C. Related Sections: The following sections contain requirements that relate to this section.

a. Section 01 11 00 - Summary of Work
b. Section 43 41 00 – Ground Storage Tank

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

B. Submit as part of bid, a list of at least five projects where painting work on tanks of like size and painting requirements, have been performed by the bidder or bidder's subcontractor within the last three years. Also, bidder or bidder's subcontractor shall provide documentation as to tank painting work performed within a minimum of the last five years.

C. Samples for initial color selection in the form of manufacturer's color charts.

D. Bidder or bidder's subcontractor shall submit Certificate of Insurance that shall include the work classification code 5037 "the painting of metal structures, over two stories, in the State of Illinois".

F. The Contractor shall submit to the Engineer/Owner, immediately upon completion of the job, certification from the paint manufacturer indicating that the quantity of each coating purchased was sufficient to coat all surfaces in accordance with the specifications and manufacturer's recommendations.

1.4 QUALITY ASSURANCE

A. Contractor Qualifications: An experienced Contractor who has completed painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.

B. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

C. Comply with the requirements of the following codes, standards and regulations:

1. Painting of tank: American Water Works Association Standard D102-14
2. Society of Protective Coatings (SSPC) Surface Preparation Specifications and Containment Guide.
3. All applicable United States Environmental Protection Agency (USEPA) and Illinois Environmental Protection Agency (IEPA) regulations.
4. Occupational Safety and Health Association (OSHA) 29 CFR.
5. All local regulations applicable to this type of work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45º F (7º C) and/or in accordance with manufacturer's instructions. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.6 SITE EXAMINATION

A. The ground storage tank is to be located on the Robinson-Palestine Water Commission's new water treatment plant site as shown on the plans. Contractor(s) shall visit the site and judge for themselves all of the circumstances affecting the cost and nature of the work prior to submitting their bid. Containment of the structure is at the discretion of the Contractor – it is not a requirement of this Specification.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A All materials specified herein are manufactured by the Tnemec Company, Inc., North Kansas City, Missouri

B. Equivalent materials of other manufacturers may be substituted by approval of the Engineer.

C. Requests for substitution shall include manufacturer's technical data sheets for each product giving descriptive information, solids by volume, recommended dry film thickness, a list of five projects, with contact person, where each product has been used and rendered satisfactory service for at least three years. The burden of proof of the merit of the proposed substitute is upon the proposer. The decision of the Engineer/Owner regarding approval or disapproval of the proposed substitution shall be final.

2.2 MATERIALS

A. All paint shall be of the best grade, made from pure materials as required; same to be mixed to manufacturer's specifications for the type of surface to be covered.

B. All material, colors and mixtures shall be approved by the Engineer.

C. All material used for prime and finish coats shall be compatible and of the same manufacturer.

D. Colors: Provide color selections made by the Engineer from the manufacturer's full range of standard colors.

2.3 FINISHES

A Refer to schedule in this section.

B. Color as selected by the Owner.

PART 3 EXECUTION

3.1 WORKMANSHIP

A. The Contractor shall protect his work at all times, and protect adjacent structures including, but not limited to, control boxes, conduits, light fixtures, floors, antennas, building, cars, etc., from physical damage and overspray. On completion of the work the Contractor shall clean

off paint from any item damaged by overspray and replace or repair any from damage by blasting operations at his expense.

B. All materials shall be applied by skilled industrial painters.

3.2 SURFACE PREPARATION

A. Shop Surface Preparation: Remove all oil and grease from the surface prior to blast or shot-blast cleaning. The surface shall be abrasive blast cleaned, removing all rust, dirt, mill scale and foreign matter in accordance with the SSPC specification as listed below. A minimum angular blast profile of 2.0 mils is required.

1. Exterior surfaces: SSPC SP-10

2. Interior Wet surfaces: SSPC SP-10

3. Grind any metal imperfections, such as slivers, delaminations, or scabs, before coating. Ground areas should be reblasted if profile or cleanliness is impaired.

4. In the event that it is not possible to remove all surface contaminants during the abrasive cleaning process, a suitable chemical cleaning material may be used on approval of the ENGINEER to restore the blasted surface to the required condition for optimum coating test performance.

B. Field Surface Preparation: Remove all oil, grease, dust, dirt and foreign matter from the entire surface. Weld slag, weld splatter, rough edges and sharp edges of weld seams shall be ground smooth. All rusted, abraded and unpainted areas shall be abrasive blast cleaned to a "Near White Finish" in accordance with the recommended methods outlined in the SSPC Specification SP-10. A minimum angular blast profile of 2.0 mils is required.

1. Cast and Ductile Iron shall be abrasive blast cleaned in accordance with NAPF 500-03. **Brush-off blast clean, SSPC SP-7, all surfaces shop coated with an epoxy primer.**

C. Failed Areas: Spot abrasive blast failed areas to a near white finish, removing all existing paint, rust, dirt, mill scale and foreign matter by the recommended methods outlined in SSPC SP-10 and brush blast the failed area, feathering blast into solid paint. Brush off blast clean, SSPC SP-7, all interior surfaces if recoat window has lapsed.

D. Surface Cleaning Prior to Painting: After blasting and prior to painting, all surfaces shall be air blown, vacuumed, wiped or brushed free of dust or other loose surface contamination. All dust and contaminants shall be entirely removed from the area to be painted so that dust and contaminants are not trapped in the paint. Whatever metal is cleaned on any day shall be coated with primer on the same day. If rust forms prior to painting, the surface shall be recleaned as necessary before the application of primer.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Provide finish coats that are compatible with primers used.
3. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer.
4. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.

C. No paint shall be applied when the surrounding temperature, as measured in the shade, is at or below the manufacturer's recommended minimum surface temperature (varies by coating). The surface temperature of the steel shall be a minimum of 5°F above the dew point temperature during all paint application periods. Paint shall not be applied when the temperature of the surface to be painted is below the manufacturer's recommended minimum surface temperature. Paint shall not be applied to wet or damp surfaces, and shall not be applied in rain, snow, fog or mist, or when the relative humidity exceeds 85%.

D. The Contractor may provide temporary heating or dehumidification equipment to sustain appropriate conditions as necessary, incorporating these costs into the appropriate bid item. These specifications do not require the use of this equipment, but each Contractor is encouraged to consider this with respect to efficiency and completion schedule.

E. No paint shall be applied when it is expected that the relative humidity will exceed 85% and/or that the air temperature will drop below the manufacturer's recommended minimum surface temperature within 12 hours after the application of the coating. Dew or moisture condensation shall be anticipated, and if such conditions are prevalent, painting shall be delayed until certain that the surfaces are dry. Further, the day's painting should be completed well in advance of the probable time of day when condensation will occur, in order to permit the film an appropriate drying time prior to the formation of moisture on the surface.

F. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.

1. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required. If material has thickened or must be diluted for application by spray gun, the coating shall be built up to the specified thickness by application of an additional coat(s) of paint.

2. All work shall be cut-in neatly and finish coats shall be uniform in color and texture without streaks, laps, heavy build-ups, runs, sags or missed areas.

3. All surfaces to be painted and finished will be inspected after preparation and after finishing and in each case will be subject to the approval of the Engineer/Owner. Any unsatisfactory work shall be put in the proper condition and where necessary, the finish shall be removed and the surfaces refinished according to specifications.

4. At completion of work, all defects and blemishes shall be corrected by touching up. If touch-up cannot be concealed, the entire surface shall be recoated.

3.4 SCHEDULE

A. Exterior Paint Schedule – 4 Coat System

1. Shop Prime coat

   a. Paint Type: Aromatic Urethane, Zinc-Rich, Tnemec 94 - H_2O, Hydro-Zinc, 1 full coat.
   b. Required Dry Film Thickness: 2.5 to 3.5 mils per coat.
   c. Apply as soon as possible after surface preparation and before any rusting occurs, within 12 hours maximum.

2. Field "Patch" Prime Coat

   a. Paint type: Aromatic Urethane, Zinc-Rich, Tnemec 91- H_20, Hydro-Zinc 2000, spot coat to all properly prepared steel.
   b. Required Dry Film Mil Thickness: 2.5 to 3.5 mils per coat
   c. Apply as soon as possible after surface preparation and before any rusting occurs, within 12 hours maximum.

3. 1st Field Intermediate Coat

   a. Paint Type: Polyamidoamine Epoxy, Tnemec Series N69 HB Epoxoline II
   b. Required Dry Film Thickness: 2.0 to 3.0 mils per coat
   c. The coating shall be applied to all surfaces and also brush applied to the inside of the anchor bolt chairs, vent, manways, painters rings, sharp edges, and accessories.

4. 2nd Field Intermediate Coat

   a. Paint Type: Endura Shield, Tnemec Series 73 – one full coat(s)
   b. Required Dry Film Mil Thickness: 2.0 to 3.0 mils
   c. Color shall be as selected by manufacturer.

5. Field Finish Coat

   a. Paint Type: Fluoropolymer Polyurethane, Tnemec Series V700 HydroFlon, One full coat.
   b. Required Dry Film Mil Thickness: 2.0 to 3.0 mils
   c. Color: As selected by Owner

6. The MINIMUM total dry film thickness (DFT) shall be 8.5 mils.

B. Interior Wet Paint Schedule

1. Shop Prime coat

a. Paint Type: Aromatic Urethane, Zinc-Rich, Tnemec 94 - H_2O, Hydro-Zinc, 1 full coat.
b. Required Dry Film Thickness: 2.5 to 3.5 mils per coat.
c. Apply as soon as possible after surface preparation and before any rusting occurs, within 12 hours maximum.

2. Field "Patch" Prime Coat

a. Paint type: Aromatic Urethane, Zinc-Rich, Tnemec 91- H_20, Hydro-Zinc 2000, spot coat to all properly prepared steel.
b. Required Dry Film Mil Thickness: 2.5 to 3.5 mils per coat
d. Apply as soon as possible after surface preparation and before any rusting occurs, within 12 hours maximum.

3. Stripe Coat

a. Paint Type: Polyamidoamine Epoxy, Tnemec Series N140-39BL Delft Blue Pota-Pox Plus– Stripe Coat
b. Required to be brush applied only
c. All weld seams, sharp edges, roof rafters, edges of welded roof plates, etc, shall be stripe coated **BY BRUSH** to ensure adequate coverage and proper film thickness.

4. Intermediate Coat

a. Paint Type: Polyamidoamine Epoxy, Tnemec Series N140-00WH Tnemec White Pota-Pox Plus – 1 Full Coat.
b. Required Dry Film Mil Thickness: 4.0 to 6.0 mils
c. Apply as soon as possible after surface preparation and before any rusting occurs, within 12 hours maximum.

5. Field Finish Coat

a. Paint Type: Polyamide Epoxy, Tnemec Series N140-15BL Tank White Pota-Pox Plus – 1 Full Coat.
b. Required Dry Film Mil Thickness: 5.0 - 6.0 mils

6. The MINIMUM total dry film thickness shall be 11.5 mils.

3.5 CLEAN UP

A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site. Leave premises in the same condition as when work began.

3.6 STERILIZATION AND FILLING OF THE TANK

A. Adequate ventilation which will effectively remove solvents shall be provided for proper drying of paints on interior surfaces.

B. A minimum of seven days following the application of the final coat on the interior and exterior shall be allowed before the tank is sterilized or filled with water.

C. After the required paint curing period, the reservoir shall be cleaned and disinfected, conforming to the requirements of AWWA C652-11. Method 3 shall be utilized. The Contractor shall provide the means by which to disinfect the tank and coordinate with the owner for its application to the tank interior.

D. The Contractor with Owner's Representative present will sample the tank contents on two successive days. If any contamination appears, repeat samples will be taken until two consecutive samples are negative for coliform bacteria or the reservoir shall again be subjected to disinfection and resampled until two successive samples are negative.

3.7 WORKER PROTECTION

A. OSHA requirements for worker protection shall be followed in accordance with 29 CFR for the entire project.

B. Provide and require all employees to wear all personal protective equipment required for the environment to which the workers are subject to. This shall include, but not be limited to, air supplied respirators, eye protection, ear protection, protective clothing and other such items.

C. Adequate personal protective equipment shall also be provided at the job site for use by the Owner's Representative. This equipment shall be made available for the Owner's Representative's access to the project area at any time.

END OF SECTION 09 96 57

DIVISION 10 - SPECIALTIES
SECTION 10 11 00 - VISUAL DISPLAY UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glass markerboards.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking and supports.

B. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

1.3 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data on glass markerboard, trim, and accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.

D. Samples: Two, 2 by 2 inches in size illustrating materials and finish, color and texture of glass markerboard.

E. Manufacturer's printed installation instructions.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.6 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty for chalkboard and markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.1 VISUAL DISPLAY UNITS

A. Magnetic Glass Markerboards:

1. Manufacturers:

a. Claridge Products and Equipment, Inc: www.claridgeproducts.com/#sle.

b. Ghent, a GMI Company: www.ghent.com/#sle.

c. Basis of Design: Quartet; www.quartet.com.

d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Glass: Tempered, low iron, 1/4 inch thick, with bevel edges and radiused corners, laminated to steel backing sheet for use with magnets. Coated or treated for use as dry erase board.

3. Steel Backing Sheet Thickness: 24 gauge, 0.0239 inch .

4. Size: As indicated on drawings.

5. Frame: No frame.

6. Accessories: Provide magnetic marker tray, magnetic eraser, magnets, and marker sets for each board ordered.

2.2 MATERIALS

A. Float Glass: Provide float-glass-based glazing unless otherwise indicated.

1. Fully Tempered Safety Glass: Comply with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

2.3 ACCESSORIES

A. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.

B. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of markerboard, molded ends, concealed fasteners, same finish as frame.

C. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

C. Verify flat wall surface for frameless adhesive-applied boards.

3.2 PREPARATION

A. Acclimatize tackable wall panels by removing from packaging in installation area not less than 24 hours before application.

B. Remove switchplates, wall plates, and surface-mounted fixtures where tackable wall paneling is applied. Reinstall items on completion of installation.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Secure units level and plumb.

3.4 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION 10 11 00

DIVISION 10 - SPECIALTIES
SECTION 10 14 19 - DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.1 Section Includes

A. Dimensional letter signage.

1.2 Submittals

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's product literature for each type of dimensional letter sign, indicating style, font, colors, locations, and overall dimensions of each sign.

C. Shop Drawings:

1. Include dimensions, locations, elevations, materials, text and graphic layout, and attachment details.

D. Verification Samples: Submit samples showing colors and finishes specified.

E. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

F. Manufacturer's qualification statement.

1.3 Quality Assurance

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.4 Delivery, Storage, and Handling

A. Package dimensional letter signs as required to prevent damage before installation.

B. Store under cover and elevated above grade.

C. Store tape adhesive at a normal room temperature of 68 to 72 degrees F.

1.5 Field Conditions

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.1 Manufacturers

A. Dimensional Letter Signs:

1. Ace Sign Co. ; www.acesignco.com.

2. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 Dimensional Letters and Logo

A. Exterior Signage

1. Applications: Building identification.

2. Use individual high-density urethane letters.

3. Mounting Location: Exterior as indicated on drawings.

4. Allow for total of 33 letters, per sign, 12 inches high and 2 logos.

B. Plastic Letters:

1. Material: Solid Polyvinyl Chloride, PVC.

2. Thickness: Manufacturer's standard for letter size.

3. Letter Height: 6 inches.

4. Text and Typeface:

a. Character Font: Helvetica, Arial, or other sans serif font.

5. Finish: As selected by Architect from manufacturer's full range.

6. Color: _____.

7. Mounting: standoffs.

2.3 Accessories

A. Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.

PART 3 EXECUTION

3.1 Examination

A. Verify that substrate surfaces are ready to receive work.

B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.2 Installation

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION 10 14 19

DIVISION 10 - SPECIALTIES
SECTION 10 21 13.19 - PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Solid plastic toilet compartments.

B. Urinal screens.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood framing, blocking and supports.

B. Section 10 28 00 - Toilet, Bath, and Laundry Accessories: Accessories not specified herein.

1.3 REFERENCE STANDARDS

A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

1.4 SUBMITTALS

A. Product Data: Provide data on panel construction, hardware, and accessories.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

C. Samples: Submit two samples of partition panels, 4 by 4 inch in size illustrating panel finish, color, and sheen.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Solid Plastic Toilet Compartments:

1. Scranton Products; Hiny Hiders Partitions: www.scrantonproducts.com/#sle.

2. Substitutions: Section 01 60 00 - Product Requirements.

2.2 PLASTIC TOILET COMPARTMENTS

A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.

1. Color: As selected by Architect from manufacturer's full range.

2. Doors:

a. Thickness: 1 inch.

b. Width: 24 inch.

c. Width for Handicapped Use: 36 inch, out-swinging.

d. Height: 55 inch.

e. Edges: Shiplap.

3. Dividing Panels:

a. Thickness: 1 inch.

b. Height: 55 inch.

4. Urinal Screens: Without doors; to match compartments; mounted to wall with two panel brackets. Attach to floor mounted metal post where recommended by compartment manufacturer.

2.3 ACCESSORIES

A. Metal Posts: 82.75 inches (2102 mm) high, heavy duty extruded aluminum, clear anodized finish, fastened to foot with stainless steel tamper resistant screw.

B. Hidden Shoe (Foot): One-piece molded polyethylene invisible shoe inserted into metal post and secured to metal post with stainless steel tamper resistant screw.

C. Headrail Cap and Corner Cap: One-piece molded polyethylene secured to metal post with stainless steel tamper resistant screw; adjustable to level headrail to finished floor.

D. Wall Brackets: Continuous heavy duty extruded aluminum, clear anodized finish, inserted into slotted panel and fastened to panels with stainless steel tamper resistant screws.

E. Headrail: Heavy duty extruded aluminum, designer anti-grip design, clear anodized finish, fastened to headrail bracket with stainless steel tamper resistant screw and to headrail cap or corner cap with stainless steel tamper resistant screw.

1. Headrail Brackets: Heavy duty extruded aluminum, clear anodized finish, secured to wall with stainless steel tamper screws.

F. Door Hardware:

1. Hinges:

a. Edge-mounted helix style stainless steel continuous hinge.

1) Closing degree: 5 degrees.

2) Comes to a full close on its own weight

2. Occupancy Indicator Latch and Housing:

a. Material: Satin stainless steel.

b. Occupancy indicators: Green for occupied and red not occupied.

c. Slide bolt and button.

3. Coat Hook and Door Bumper Combination:

a. Material: Chrome plated Zamak

b. Handicap Door: Equip with second door pull and door stop.

4. Door Pulls: Chrome plated Zamak

G. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved Shop Drawings.

B. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

C. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.

D. Locate bottom edge of doors and panels 14 inches above finished floor.

E. Attach panel brackets securely to walls using anchor devices.

F. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

G. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

H. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.

I. Finished surfaces shall be cleaned after installation and be left free of imperfections.

3.3 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Replace damaged products before Substantial Completion.

END OF SECTION 10 21 13.19

DIVISION 10 - SPECIALTIES
SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

C. Under-lavatory pipe supply covers.

D. Electric hand/hair dryers.

E. Diaper changing stations.

F. Utility room accessories.

1.2 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.

C. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

D. ASTM C1036 - Standard Specification for Flat Glass; 2011.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

F. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004, with Editorial Revision (2016).

G. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

H. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.

2. Identify products using designations indicated.

D. CLOSEOUT SUBMITTALS

1. Maintenance Data: For toilet accessories to include in maintenance manuals.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:

1. Subject to compliance with requirements, provide product indicated as Basis of Design or comparable product by one of the following:

a. AJW Architectural Products: www.ajw.com.

b. American Specialties, Inc: www.americanspecialties.com.

c. Bobrick Washroom Equipment, Inc.: www.bobrick.com.

d. Bradley Corporation: www.bradleycorp.com.

e. Georgia-Pacific Professional: www.blue-connect.com.

f. Substitutions: Section 01 60 00 - Product Requirements.

B. Under-Lavatory Pipe Supply Covers:

1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.

2. Substitutions: Section 01 60 00 - Product Requirements.

C. Electric Hand/Hair Dryers:

1. Excel Dryer; Xlerator Hand Dryer: www.exceldryer.com/#sle.

2. Substitutions: Section 01 60 00 - Product Requirements.

D. Diaper Changing Stations:

1. Subject to compliance with requirements, provide product indicated as Basis of Design or comparable product by one of the following:

a. American Specialties, Inc: www.americanspecialties.com.

b. Bradley Corporation: www.bradleycorp.com.

c. Diaper Deck & Company: www.diaperdeck.com.

d. Koala Kare Products: www.koalabear.com.

e. Safe-Strap Company, Inc: www.diaperdepot.com.

f. Substitutions: 01 60 00 - Product Requirements.

E. All items of each type to be made by the same manufacturer. Bariatric grab bars may be from different manufacturers based on availability of products.

2.2 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative

C. Stainless Steel Sheet: ASTM A666/A666M, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

2.3 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.4 Commercial Toilet Accessories

A. [T4 - OFCI] Toilet Paper Dispenser:

1. Toilet Paper Dispensers will be provided by the Owner. Contractor is responsible for installation, including all associated coordination.

B. [T5] (OFCI) Paper Towel Dispenser:

1. Paper Towel Dispensers will be provided by the Owner. Contractor is responsible for installation, including all associated coordination.

C. [T17] (OFCI) Waste Receptacle: Stainless steel, surface mounted.

1. Liner: Removable, heavy-duty vinyl liner, attached at a minimum of four points with stainless steel grommets and hooks.

2. Minimum capacity: 20 gallons.

3. Products:

a. Basis of Design: Bobrick; B-275.

b. Substitutions: Section 01 60 00 - Product Requirements.

D. [T6] (OFCI) Soap Dispenser: Liquid soap dispenser, deck-mounted on vanity, with polyethylene container concealed below deck; piston and 4 inch spout of stainless steel with bright polished finish; chrome-plated deck escutcheon.

E. [T7] (CFCI) Mirrors: Stainless steel framed, 1/4 inch thick tempered safety glass; ASTM C1048.

1. Size: 24" x 36".

2. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.

3. Products:

a. Basis of Desgn: Bobrick; B-165 2436.

b. Substitutions: Section 01 60 00 - Product Requirements.

F. [T28] (CFCI) Mirrors, Full Length: Stainless steel framed, 1/4 inch thick tempered safety glass; ASTM C1048.

1. Size: 24" x 60".

2. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.

3. Products:

a. Basis of Design: Bobrick; B-290 2460.

b. Substitutions: Section 01 60 00 - Product Requirements.

G. Grab Bars, Typical: Stainless steel, nonslip grasping surface finish.

1. [T1-T3] Standard Duty Grab Bars:

a. Push/Pull Point Load: 250 pound-force, minimum.

b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, concealed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.

c. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.

d. Length and Configuration: As indicated on drawings.

e. Basis of Design Products:

1) [T1] Bobrick; B-5806.99 x 42

2) [T2] Bobrick; B-5806.99 x 36

3) [T3] Bobrick; B-5806.99 x 18

4) Substitutions: Section 01 6000 - Product Requirements.

H. [T21] Toiletry Shelf: 0.03 inch (0.8 mm) satin-finished stainless steel, with 1/4 inch (6 mm) rolled or 1/2 inch (12 mm) channel edge at shelf front, concealed mounting brackets.

1. Size: 5 inches deep x 18 inches long, nominal.

2. Products:

a. Basis of Design: Bobrick; B-295 x 18.

b. Substitutions: Section 01 6000 - Product Requirements.

I. [T8] Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

1. Sanitary Napkin Disposal Unit will be provided by the Owner. Contractor is responsible for installation, including all associated coordination.

J. [T16] Clothes Hook: Heavy-duty stainless steel, single-prong, circular-shaped bracket and backplate for concealed atttachment, satin finish.

1. Capacity: 300 lbs

2. Products:

a. Basis of Design: Bobrick; B-2116.

b. Substitutions: Section 01 6000 - Product Requirements.

3. At each toilet partition door, install instead coat hook with rubber bumper per Section 10 2113.13 - Metal Toilet Compartments.

2.5 Commercial Shower and Bath Accessories

A. [S6] Shower Curtain Rod: Stainless steel tube, 1-1/4 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.

1. Length: 36 inches.

2. Products:

a. Basis of Design: Bobrick; B-6047 x 36.

b. Substitutions: Section 01 60 00 - Product Requirements.

B. [S10] Shower Curtain Rod: Stainless steel tube, 1-1/4 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.

1. Length: 60 inches.

2. Products:

a. Basis of Design: Bobrick; B-6047 x 60.

b. Substitutions: Section 01 60 00 - Product Requirements.

C. [S11] Shower Curtain:

1. Shower Curtain will be provided and installed by the Owner.

D. [S7] Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, hinges and mechanical fasteners of Type 304 stainless steel, L-shaped seat.

1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of antique-white, matt-finish color.

2. Size: ADA Standards compliant.

3. Products:

a. Basis of Design: Bobrick; B-517 (right).

b. Basis of Design: Bobrick; B-518 (left).

c. Substitutions: Section 01 60 00 - Product Requirements.

E.

2.6 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. [T9] Under-Lavatory Pipe and Supply Covers:

1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.

2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.

3. Construction: 1/8 inch flexible PVC.

a. Surface Burning Characteristics: Self extinguished 0 sec (ATB), 0 mm (AEB) when tested in accordance with ASTM-D-635.

b. Comply with ICC A117.1.

c. Microbial and Fungal Resistance: Comply with ASTM G21.

4. Color: White.

5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.

6. Products:

a. Basis of Design: Truebro; Lav Guard 2.

b. Substitutions: Section 01 60 00 - Product Requirements.

2.7 Diaper Changing Stations

A. [T10] Horizontal Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.

1. Material: Polyethylene.

2. Mounting: Surface. Projects not more than 4 inches from wall when closed.

3. Color: Gray.

4. Minimum Rated Load: 50 pounds.

5. Products:

a. Basis of Design: Koala Kare; KB200-01SS.

b. Substitutions: 01 60 00 - Product Requirements.

2.8 Utility Room Accessories

A. [T17] (CFCI) Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, hat-shaped channel.

1. Holders: Three spring-loaded rubber cam holders.

2. Length: 36 inches.

3. Length: Manufacturer's standard length for number of holders.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Wall backing: Install concealed wall backing as required to support each item.

D. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.4 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 10 28 00

DIVISION 10 - SPECIALTIES
SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood wall framing and blocking requirements.

1.3 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.

B. FM (AG) - FM Approval Guide; Current Edition.

C. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.

D. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.4 SUBMITTALS

A. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, and anchorage details.

B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.5 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire Extinguishers:

1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical: www.activarcpg.com/#sle.

2. Larsen's Manufacturing Co; MP Series - Multi-Purpose Dry Chemical Extinguisher: www.larsenmfg.com/#sle..

3. Oval Brand Fire Products; Oval Dry Chemical Fire Extinguisher - Multipurpose ABC: www.ovalfireproducts.com/#sle.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:

1. Activar Construction Products Group, Inc. - JL Industries; Ambassador Series: www.activarcpg.com/#sle.

2. Larsen's Manufacturing Co; Architectural Series: www.larsensmfg.com/#sle.

3. Oval Brand Fire Products; Cabinets for Low Profile Extinguishers: www.ovalfireproducts.com/#sle.

4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.

1. Class: A:B:C type.

2. Size: 10 pound.

3. Finish: Baked polyester powder coat, red color.

2.3 FIRE EXTINGUISHER CABINETS

A. Cabinet Construction: Non-fire rated.

1. Formed primed steel sheet; 0.036 inch thick base metal.

B. Cabinet Configuration: Semi-Recessed type. Recess depth to match wall construction.

1. Size to accommodate extinguisher and accessories.

C. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.

D. Door Glazing: Full Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

E. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.

F. Finish of Cabinet Interior: White colored enamel.

2.4 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings. See drawings for dimension requirements.

C. Secure rigidly in place.

D. Place extinguishers in cabinets and on brackets just prior to the date of Substantial Completion.

3.3 MAINTENANCE - SELF-SERVICE FIRE EXTINGUISHERS

A. Inspection Certification Tag: Provide tag indicating acceptable condition of fire extinguisher, date of inspection, and name of self-service inspector for initial inspection.

END OF SECTION 10 44 00

DIVISION 10 - SPECIALTIES
SECTION 10 51 13 - METAL LOCKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall attached, floor supported open-front metal gear lockers.

B. Locker benches.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete floor construction for attachment of locker floor support.

B. Section 06 10 00 - Rough Carpentry: Wood wall framing and concealed wood blocking and nailers.

C. Section 06 6400 - Plastic Paneling: Factory applied plastic paneling and gypsum wallboard wall finish

1.3 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

1.4 SUBMITTALS

A. Product Data: Manufacturer's published data on locker construction, sizes, and accessories.

B. Shop Drawings: Indicate locker plan layout.

C. Samples: Submit two samples 3 by 6 inches in size showing color and finish of metal locker material.

D. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum fifteen years experience in the direct manufacture of metal lockers.

B. Installer Qualifications: Minimum 5 years documented experience in the installation of similar metal lockers.

C. Reference:

1. ASTM A513 - Minimum Properties of Electric-Resistence-Welded Carbon Allow Steel Mechanical Tubing.

2. ASTM A510 - Minimum Properties of Wire Rods and Coarse Round Wire, Carbon Steel and Alloy Steel.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers with labels identifying product and manufacturer's name clearly visible.

B. Storage: Store materials in a clean, dry area.

C. Protect locker finish and adjacent surfaces from damage during handling and installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Wall attached, Floor Supported Metal Gear Lockers:

1. Basis of Design: GearGrid Corporation; Forest Lake, MN: Geargrid Wall Mounting Storage System: www.geargrid.com/#sle.

2. Ready Rack, Inc.; Woodstock, IL: Wall Mounted Red Rack: www. readyrack.com/#sle.

2.2 LOCKER APPLICATIONS

A. Open-Front Turnout Gear Lockers: Metal lockers, Wall mounted.

1. Width: 18 inches.

2. Depth: 20 inches.

3. Height: 74 inches, nominal.

4. Configuration: Single tier.

5. Fittings:

a. Vertical Dividers:

1) Outer Frames: 1.25" O.D. 16 gauge wall thickness ASTM A513 steel tubing.

2) Inner Grid: .25" diameter ASTM 510 cold drawn steel wire resistance welded to a 3" square (nominal) pattern.

3) Inner Grid wires shall run full length and width of inside vertical divider frame. Wires not running full length or width, thus creating exposed wire ends shall not be acceptable.

4) Inner Grid wires shall run horizontally and vertically creating a square or consistent rectangular grid pattern only. Grid wires not creating a square or consistent rectangular grid pattern shall not be acceptable.

   a) Inner Grid wires shall intersect and cross all perpendicular wires and shall be welded at all wire intersections.

b. Back Panel:

1) Required on each locker to protect the locker contents and ther adjacent wall surface as well as providing an additional panel to mount accessories.

2) Grid: .25" diameter ASTM 510 cold drawn steel wire resistance welded to a 3" square (nominal) pattern.

3) Back panel shall engage and be secured to vertical dividers using horizontal wires which extend into mounting holes pre-drilled in the vertical divider panels. Back panels are sandwiched between vertical divider panels, preventing them from being removed after assembly is complete.

4) Inner Grid wires shall run full length and width of inside back panel frame. Wires not running full length or width, thus creating exposed wire ends shall not be acceptable.

5) Inner Grid wires shall run horizontally and vertically creating a square or consistent rectangular grid pattern only. Grid wires not creating a square or consistent rectangular grid pattern shall not be acceptable.

   a) Inner Grid wires shall intersect and cross all perpendicular wires and shall be welded at all wire intersections.

c. Shelves: Shelves shall be fabricated from .25" diameter ASTM 510 cold drawn steel wire resistance welded and cold formed.

1) Upper shelf shall include an integrated 20 gauge steel bracket to accept a 2" x 16" name placard facing forward.

2) Boot shelf: Locate at the bottom of both the back panel and the vertical dividers.

d. Hang Bar: Hang bars shall be fabricated from .25" O. D. x 16 gauge 304 stainless steel tubing.

1) Hang bars shall be constructed to allow each locker user to position at a different height.

2) Brackets: Constructed to allow hang bars to be securely attached to each vertical divider.

a) Brackets shall be powder coated.

e. Hooks: Four single prong.

6. Wall Spacer(s): Manufacturer's standard 2 inch prefinished wall spacer(s).

a. Location, spacing: As recommended by system manufacturer for conditions involved. Coordinate placement of wood blocking within the wall(s); See Section 06 1000. Coordinate location(s) of wall spacers with the vertical trim accessories and locations of exposed fasteners for plastic paneling; See Section 06 6400.

b. Attachment device(s): As recommended by system manufacturer for attachment to concealed wood blocking. Install after wall finsh has been installed and wall base is complete.

7. Floor Support(2): Manufacturer's standard 6 inch prefinished floor support(s).

a. Location, spacing: As recommended by system manufacturer for conditions invloved.

b. Attachment device(s): As recommended by system manufacturer for conditions related to the cast-in-place concrete floor and finish involved. See Sections 03 3000 and _____.

8. Color: Black.

2.3 METAL LOCKERS

A. Locker Construction: As previously specified.

2.4 LOCKER BENCHES

A. Locker Benches: Free standing type; bench top of laminated birch; painted steel pedestals.

1. Accessibility: Comply with ICC A117.1 and ADA Standards.
2. Height: _____ inch.
3. Width: 20 inch minimum; 24 inch maximum.
4. Length: 42 inch.

B. Locker Bench Support Brackets: Welded structural aluminum double arm floor mount pedestal bench support brackets; pre-drilled for bench top material attachment and for floor anchorage.

1. Accessibility: Comply with ICC A117.1 and ADA Standards.
2. Load Capacity per Bracket: 400 pounds.
3. Finish: Black powdercoat.
4. Bracket Spacing: 36 inches on center, maximum. Project-specific spacing to be determined based on field measurements.
5. Bracket-to-Floor Attachment: Fasteners/anchors recommended by bracket manufacturer for floor construction conditions encountered.
6. Bench Top: _____.
7. Products:
   a. Rakks/Rangine Corporation; Bench Support Brackets; Model _____: http://www.rakks.com/#sle.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that concealed blocking is in the correct position and configuration.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install lockers plumb and square.

C. Attach wall spacers through applied wall finish into previously installed wood blocking.

1. Attach to locker assemble as recommended by locker manufacturer.

2. Do not damage applied wall finish.

D. Install floor supports as recommended by locker manufacturer.

1. Attach to locker assembly as recommended by locker manufacturer.

E. Join adjacent locker units together as recommended by locker manufacturer to provide rigid installation.

F. Install fittings if not factory installed.

G. Install locker bench as recommended by bench manufacturer.

END OF SECTION 10 51 13

DIVISION 12 - FURNISHINGS
SECTION 12 24 00 - WINDOW SHADES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior manual roller shades.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.3 REFERENCE STANDARDS

A. WCMA A100.1 - Safety of Corded Window Covering Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.

B. Sequencing:

1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.

2. Do not install shades until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

D. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

G. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

H. Maintenance contracts.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.8 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:

1. Shade Hardware: One year.

2. Fabric: One year.

3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.1 Manufacturers

A. Interior Manually Operated Roller Shades:

1. Basis of Design: Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.

2. Hunter Douglas Architectural; RB500 Manual Roller Shades: www.hunterdouglasarchitectural.com/#sle.

3. MechoShade Systems LLC; Mecho/7 System: www.mechoshade.com/#sle.

4. SWFcontract, a division of Springs Window Fashions, LLC.; Pro Series Manual Solar Shade System: www.swfcontract.com/#sle.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.2 Roller Shades

A. General:

1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.

2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Roller Shades Type RS-1:

1. Description - Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.

a. Drop Position: Regular roll.

b. Roll Direction: Roll down, closed position is at window sill.

c. Mounting: Window jamb mounted - inside, between jambs.

d. Size: Verify in Field.

2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.

3. Roller Tubes: As required for type of shade operation.

a. Material: Extruded aluminum, clear anodized finish.

b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.

4. Hembars: Designed to maintain bottom of shade straight and flat.

a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.

5. Manual Operation for Interior Shades:

a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.

b. Drive Chain: Continuous loop, beaded ball chain with restraining device, 95 lb minimum breaking strength; comply with WCMA A100.1. Provide upper and lower limit stops.

6. Accessories:

a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; clear anodized finish.

b. End Caps: Provide manufacturer's standard end caps to cover exposed ends of brackets.

2.3 Shade FABRIC

A. Fabric for Light-Filtering Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.

1. Manufacturers:

a. Mermet Corporation; E-Screen - 0.5%: www.mermetusa.com/#sle.

b. Substitutions: See Section 01 60 00 - Product Requirements.

2. Material: Vinyl coated polyester.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.2 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.4 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.5 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

B. Training: Train Owner's personnel on operation and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.6 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION 12 24 00

DIVISION 12 - FURNISHINGS
SECTION 12 35 53.19 - WOOD LABORATORY CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Standard and custom plastic-laminate-clad laboratory cabinets and cabinet hardware.

B. Epoxy resin countertops.

C. Laboratory sinks.

1.2 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Wall constrcution.

B. Section 07 92 00 - Joint Sealants: Sealing joints between laboratory casework and countertops and adjacent walls.

C. Section 09 65 00 - Resilient Flooring: Resilient wall base.

D. Section 12 36 00 - Countertops: Additional requirements for countertops.

E. Section 22 40 00 - Plumbing Fixtures: Faucets, water piping, waste and vent piping.

1.3 DEFINITIONS

A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.

B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.

C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.4 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.

C. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

E. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

G. SEFA 8W - Laboratory Grade Wood Casework; 2010.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate installation of casework with related items.

1. Service Fixtures: Coordinate location and characteristics of service connections.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.6 SUBMITTALS

A. Product Data: Component dimensions, configurations, construction details, joint details, attachments; manufacturer's catalog literature on hardware, accessories, and service fittings, if any.

B. Shop Drawings: Indicate laboratory casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements placement dimensions and tolerances, clearances required, and utility locations, if any. Include coordinated information for laboratory equipment specified in another section and/or furnished by Owner.

C. Samples For Color Selection: Plastic laminate samples, for color selection. Minimum Sample Size: 2 inches by 3 inches.

D. Test Reports: From independent laboratory indicating compliance with referenced chemical-resistance standards for countertop finish materials.

E. Manufacturer's installation instructions.

F. Installer's qualification statement.

G. Maintenance Data: Manufacturer's recommendations for care and cleaning.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.

B. Acceptance at Site:

1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.

C. Storage:

1. Store laboratory casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" paragraph of this section.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Plastic-Laminate-Clad-Laboratory Cabinets:

1. Case Systems: www.casesystems.com/#sle.

2. Diversified Casework: www.diversifiedcasework.com/#sle.

3. Labscape LLC: www.labscape.com/#sle.

4. TMI Systems Corporation: www.tmisystems.com/#sle.

B. Epoxy Resin Countertops:

1. Basis of Design: Durcon (Epoxy resin): www.durcon.com/#sle.

2. ChemTops(Epoxy resin): www.epoxytops.com/#sle.

3. Formaspace, Epoxy Tops (Epoxy resin): www.epoxytops.com/#sle.

4. Prime Industries Inc (Epoxy resin): www.piilab.com

C. Epoxy Resin Sinks: Same manufacturers as countertops.

2.2 PLASTIC-LAMINATE-CLAD LABORATORY CABINETS

A. Design:

1. Style: Flush overlay.

B. Exposed Materials:

1. Plastic-Laminate Grade: HGS.

a. Color(s) and Pattern(s): As selected by Architect from manufacturer's full range.

b. Unless indicated, provide specified edgebanding on all edges.

C. Semiexposed Materials:

1. Plastic Laminate: Grade VGS unless otherwise indicated. Provide plastic laminate for semiexposed surfaces unless otherwise indicated.

a. Color(s): As selected by Architect from manufacturer's full range.

b. Provide plastic laminate of same grade as exposed as exposed surfaces for interior faces of doors and drawer fronts and other locations where opposite side of componenet is exposed.

D. Concealed Materials:

1. Plywood: Hardwood plywood.

E. Cabinet Construction:

1. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:

a. Base Cabinets: 22 inches.

b. Upper Cabinets: 12 inches.

F. PLASTIC-LAMINATE CABINET MATERIALS

1. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated, and made without urea formaldehyde.

2. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.

   a. Acceptable Manufacturers: Subject to compliance with requirements:

      1) Basis of Design: Wilsonart International; Division of Premark International, Inc.: www.wilsonart.com/#sle.

      2) Formica Corporation: www.formica.com/#sle.

      3) Panolam Industries International: www.panolam.com/#sle.

3. Edgebanding for Exposed Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors and drawer fronts, 1 mm thick elsewhere.

   a. Color(s): As selected by Architect from manufacturer's full range.

4. Fittings and Fixture Locations: Cut and drill counter tops, backs, and other components for service outlets and fixtures.

5. Access Panels: Where indicated or otherwise required, for maintenance of utility service and mechanical and electrical components.

6. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.

2.3 CABINET HARDWARE

A. Manufacturer's standard types, styles, and finishes.

B. Comply with BHMA A156.9 requirements.

   1. Acceptable base materials for plated finishes include brass, bronze, and steel.

C. Finish of exposed stainless steel components: No.4 finish.

D. Shelves in Cabinets:

   1. Provide manufacturer's standard shelf standards.

   2. Provide number of shelves in each base and wall cabinet as shown on the drawings.

E. Swinging Doors:

1. Hinges: Offset pin, number as required by referenced standards for width, height, and weight of door.

a. European-Style Hinges: For overlay doors, concealed. Steel, nickel-plated, 110 degree opening angle.

2. Catches: Magnetic.

3. Pulls: Chrome wire pulls, 4 inches wide.

4. Drawers:

a. Pulls: Chrome wire pulls, 4 inches wide.

b. Slides: Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

2.4 EPOXY RESIN COUNTERTOPS

A. Countertops: Chemical Resistant Surface

1. Epoxy Resin Countertops: Filled epoxy resin molded into homogenous, non-porous sheets; no surface coating and color and pattern consistent throughout thickness; with integral or adhesively seamed components.

a. Flat Surface Thickness: 1 inch, nominal.

b. Surface Finish: Smooth, non-glare.

c. Color: See drawings.

d. Countertop Configuration:As shown on drawings.

e. Exposed Edge Shape: 3/16 inch radius corner.

f. Drip Edge: Drip groove 1/8 inch wide and deep, located 1/2 inch back from edge on underside of each exposed edge.

g. Back and End Splashes: Same material, same thickness; separate for field attachment.

2.5 SINKS

A. Laboratory Sinks:

1. General: Sinks with perimeter lip for drop-in installation.
2. Sink : Single-bowl.
    a. Material: Epoxy
    b. Mounting: Drop-in.
    c. Size: See drawings.
3. Sink Fabrication: Molded in one piece with smoot surfaces, coved inside corners, and bottomsloped to outlet; 1/2 inch minimum thickness.
    a. Provide sinks for drop-in installation with 1/4-inch thick lip around perimeter of sink.
    b. Provide cutouts for faucets and other accessories. Coordinate with faucet and accessory manufacturer. Show cutout(s) on shop drawings for coordination.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Environmental Conditions:
    1. Do not deliver plastic-laminate-clad laboratory cabinets until the following conditions have been met:
        a. Building has been enclosed (windows and doors sealed and weather-tight).
        b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
        c. Ceiling, overhead ductwork, piping, and lighting have been installed.
        d. Installation areas do not require further “wet work” construction.

B. Verify adequacy of support framing and anchors.

C. Verify that service connections are correctly located and of proper characteristics.

3.2 INSTALLATION

A. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.

B. Set casework items plumb and square, securely anchored to building structure.

C. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.

D. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:

1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.

2. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.

3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.

4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

E. Base Cabinets: Fasten cabinets to concrete masonry wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.

F. Wall Cabinets: Fasten to hanging strips, and/or concrete masonry wall substrates. Fasten each cabinet through back, near top, at not less than 16 inches on center.

G. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.

H. Countertops: Install countertops in one true plane, with ends abutting at hairline joints, and no raised edges.

I. Deliver sinks in properly marked boxes, accompanied with written instructions, for supervised installation by appropriate trade contractor(s).

J. Replace units that are damaged, including those that have damaged finishes.

3.3 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.4 CLEANING

A. Clean casework and other installed surfaces thoroughly.

3.5 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent installers from standing on or storing tools and materials on casework or countertops.

C. Repair damage that occurs prior to Date of Substantial Completion, including finishes, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION 12 35 53.19

DIVISION 12 - FURNISHINGS
SECTION 12 36 00 - COUNTERTOPS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Wall-hung counters, back splashes, and end splashes.

1.2 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wall construction, concealed blocking.

B. Section 06 41 00 - Architectural Wood Casework: Laminate casework.

C. Section 081113 - Hollow Metal Doors and Frames: Frames related to the installation of solid surface countertops.

D. Section 088000 - Glazing: Laminated glass at solid surface counter.

E. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard wall surface.

F. Section 07 9200 - Joint Sealants.

G. Section 08 5659 - Service and Teller Window Units: Transaction drawer assembly.

H. Section 12 35 53.19 - Wood Laboratory Casework: Laboratory casework and epoxy countertops.

I. Section 22 40 00 - Plumbing Fixtures: Sinks.

1.3 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Specimen warranty.

B. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

C. Verification Samples: For each finish product specified, minimum size 8 inches square, representing actual product, color, and patterns.

D. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

E. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 COUNTERTOPS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.

B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.

1. Flat Sheet Thickness: 1/2 inch, minimum.

2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic resin, unfilled, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.

a. Manufacturers:

1) Dupont; <>: www.corian.com.

b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.

c. Color and Pattern: As indicated on drawings.

3. Other Components Thickness: 1/2 inch, minimum.

4. Exposed Edge Treatment: Built up to minimum 1-1/2 inch thick; 1/8 inch radius, eased edge.

5. Back and End Splashes: Same sheet material, 1/8 inch radius, eased edge top; minimum 4 inches high.

a. Back Splashes: Integral; See drawings for detail.

b. End Splashes: Loose.

6. Counter Apron: As indicated on drawings.

7. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 - Countertops, Premium Grade.

2.2 ACCESSORY MATERIALS

A. Wood-Based Components:

1. Wood fabricated from old growth timber is not permitted.

B. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf minimum density; minimum 1/2 inch thick; join lengths using metal splines.

C. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.

D. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

E. Joint Sealant: Mildew-resistant silicone sealant, clear or as otherwise selected by Architect.

F. Concealed Support Brackets for countertops without base cabinets:

1. Type: Support brackets fabricated by welding miter cut extruded aluminum (or steel) sections, grinding and deburring sharp edges and welds (without compromising structural integrity), factory drilling holes for field attachment and factory finish.

2. Provide where shown on drawings at 48" o.c. maximum.

3. Color: Gray.

4. Manufacturers:

a. Basis of Design:

1) Rangine Corp., Rakks Counter Support Brackets, Model EH-1824FM: www.rakks.com/#sle.

b. A & M Hardware, Inc.; Model C-24 Concealed Brackets(steel): www.aandmhardware.com/#sle.

c. Substitutions: See Section 01 6000 - Product Requirements.

G. Grommets: Round, 2" OD, molded plastic and matching plastic caps with slot for wire passage.

1. Basis of Design: Doug Mockett, TG1 Grommet Sleeve.

a. Color: To be selected by Architect from manufacturer's full range of colors.

b. Location(s): At plastic laminate countertops.

2.3 FABRICATION

A. Fabricate tops, backs and end splashes in the largest sections practicable, with top surface of joints flush.

1. Join lengths of tops using best method recommended by manufacturer.

2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.

3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.

C. Seal joint between back/end splashes and adjacent vertical surfaces.

3.4 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.5 CLEANING

A. Clean countertops surfaces thoroughly.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 12 36 00

DIVISION 13 - SPECIAL CONSTRUCTION
SECTION 13 34 00 - PRE-ENGINEERED BUILDING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pre-engineered building systems, including but not limited to building foundation, reinforced cast-in-place concrete slab-on-grade, primary and secondary structural framing systems, roofing, siding, overhead sectional doors with electric operators, hollow metal man doors, and accessories.

1. Clear span truss and above grade columns on concrete foundation.

B. Description: 50-foot x 100-foot overall footprint, foundation, reinforced cast-in-place concrete slab-on-grade with finished floor elevation of 480.00. Clear interior vertical distance from top of concrete slab-on-grade to bottom of roof trusses shall be 18'–0". Building to include a 12' deep 50' nominal porch with shed roof on the north side of the building. Clear exterior vertical distance from top of concrete slab-on-grade to bottom of porch trusses shall be 12'–0" with 3 posts evenly space in the 50' dimension.

1. Roof slopes: 3:12 with typical 2'–0" eave with manufacturer's standard prefinished metal fascia and soffit.

2. Gutters and Downspouts: Manufacturer's standard prefinished metal gutters and downspouts; designed and constructed in accordance with SMACNA requirements.

3. Doors:

a. Man-doors: 3'–0" wide x 7'–0' high; One at SW corner of the building facing South and one at the NE corner facing North to porch area.

b. Sectional Overhead doors: Three 12'–0" wide x 14'–0" high overhead doors at West elevation; coordinate exact location with Architect.

1) Provide electric operators with manual chain backup operation. Controls shall be three button type; located adjacent each door.

2) Provide two windows at each door; Manufacturers standard safety glazing at standard height.

1.2 REFERENCES

A. ASTM International (ASTM):

1. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
2. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM C991 - Standard Specification for Flexible Glass Fiber Insulation for Metal Buildings.
4. ASTM D523 - Standard Test Method for Specular Gloss.
5. ASTM D3363 - Standard Test Method for Film Hardness by Pencil Test.
6. ASTM D4145 - Standard Test Method for Coating Flexibility of Pre-painted Sheet.
7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SYSTEM DESCRIPTION

A. Structural Frame Design:

1. Design shall be based on the building framing and enclosure as shown on the drawings.
    a. Type: Clear span roof truss.
    b. Columns: Bolted to cast-in-place concrete foundation.
    c. Purlins: On-edge above truss, factory drilled and fastened with 3/16-inch x 6-inch screws.

B. Structural Requirements:

1. Building Code: International building Code (IBC) and ASCE-7, current edition.
2. Design Loads:
    a. Ground Snow Load: 20 psf.
    b. Ground Exposure Factor: C.
    c. Roof Load, Live load: 20 psf.
    d. Wind Load: Wind speed (3 sec gust): 90 mph.

e. Maximum Considered Earthquake 0.2 Second Spectral Response Acceleration.

f. Seismic Design Category: C.

g. Collateral Loads: Additional loads imposed by contract documents other than weight of building systems specified in this section.

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Manufacturer's specifications and installation instructions for building components and accessories.

B. Shop Drawings: Showing roof framing, cross sections, roof and wall covering and trim details and accessory and component details clearly indicating proper assembly.

C. Structural Engineer Certification: Letter signed by a Professional/Structural Engineer, registered to practice in the jurisdiction of the project, verifying compliance with Snow Design Requirements. Letter shall reference specific dead loads, live loads, wind loads, tributary area load reductions (if applicable) collateral loads, seismic loads, end use categories, and governing building code including edition and load applications.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum ten years’ experience in producing pre-engineered wood buildings of the type specified.

B. Structural Engineer's Qualifications: Minimum of three years designing post frame structures; registered in the jurisdiction of the project.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation. Follow manufacturer's recommended storage procedures. Do not allow steel siding and roofing to contact the ground.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of authorities having jurisdiction.

1.7 WARRANTY

A. Structural Design - Lifetime: Manufacturer warrants that the building will not experience an occurrence of structural failure or an occurrence of structural damage due to improper structural design on account of weather conditions, such as wind, ice, and snow.

B. Preservative Treated Materials: 50 years. Preservative treated lumber, including structural columns, are warranted by the original materials manufacturer against failures due to fungal decay and termite infestation.

C. Roofing and Siding Finish, steel panel: Warranted by the original materials manufacturer for minimum 20 years from the date of shipment.

D. Installation Warranty: One-year general installation warranty, five years against roof leaks.

PART 2 PRODUCTS

2.1 STRUCTURAL FRAMING

A. Footings:

1. Column Foundation:

a. Monolithic floating reinforced, cast-in-place concrete slab. Sized and reinforced as specified in the approved shop drawings.

b. Reinforced, cast-in-place concrete frost wall and foundation. Sized and reinforced as specified in the approved shop drawings.

B. Primary Framing:

1. Columns:

a. Treated Lumber Section:

1) Lumber: No. 1 or Better Southern Yellow Pine, pressure treated with Chromated Copper Arsenate, Type III, to a retention of 0.6 pcf (9.6 kg/m3) and kiln dried after treating to 19 percent maximum moisture content.

2) Fabrication: Laminate individual pieces using ring shank feed nails per manufacturer's engineered nailing pattern. Fasteners shall have ASTM A153 galvanizing.

b. Untreated Lumber Section:

1) Lumber: Lumber: No. 1 or Better Southern Yellow Pine or Douglas Fir-Larch or other equivalent NDS approved species/grade kiln dried to 19 percent maximum moisture content.

2) Fabrication: Laminate individual pieces using ring shank feed nails per manufacturer's engineered nailing pattern.

3) Grade and size shall be selected to support imposed loads within deflection limits.

c. End Joint Connection of Treated and Untreated Sections: Factory fabricated finger joint.

d. Configuration:

1) Sidewall and Endwall Columns: 3 ply or 4 ply combining 2x4, 2x6, 2x8, or 2x10 (50x150, 50x200, 50x250 mm) dimension lumber as required by "Structural Design" requirements specified herein.

2) Corner Columns: 2 ply or 3 ply 2x4, 2x6 or 2x8 (50x150, 50x200 mm) dimension lumber as required by "Structural Design" requirements specified herein.

e. Column on Concrete Foundation:

1) Provide cast-in-place anchors.

2. Trusses: Comply with "Structural Design" and "Quality Assurance" requirements as specified herein.

a. Comply with TPI "Design Specification for Metal Plate Connected Wood Trusses" and "Quality Standard for Metal Plate Connected Wood Trusses."

b. Manufacturer shall have a third-party inspection program to verify compliance with requirements of TPI.

c. Stamp trusses with inspection agency identification.

C. Secondary Framing:

1. Purlins and Girts:

a. Lumber: No. 2 or Better dimension lumber kiln dried to 19 percent maximum moisture content.

b. Configuration: 2x4 or 2x6 or 2x8 (50x100, 50x150, 50x200 mm) as required by "Structural Design" requirements specified herein.

1) Girts: Size, grade and spacing to meet wind and deflection criterion.

a) Face mounted to exterior side of column.

2) Purlins: Factory drilled and dadoed to accept 3/16-inch diameter x 6-inch screw fastener and ensure building modularity.

c. Spacing: As required by "Structural Design" requirements specified herein.

2. Sill Plate:

a. Lumber: No. 2 or Better Southern Yellow Pine, preservative treated to a retention of 0.17 pcf (B2O3) borate (0.25 pcf disodium octaborate tetrahydrate DOT) and kiln dried after treating to 19 percent maximum moisture content.

b. Configuration: 2x4 or 2x6 or 2x8 or 2x10 (50x100 or 50x150 or 50x200 or 50x250 mm) dimension lumber as required by "Structural Design" requirements specified herein.

3. Bracing, Wall and Lateral Truss Type (where required by "Structural Design"):

a. Lumber: No. 2 or Better dimension lumber.

b. Configuration:

1) 2x4 or 2x6 (50x100, 50x150 mm) as required by "Structural Design" requirements specified herein.

2.2 CONCEALED FASTENER METAL ROOF PANELS

A. Manufacturer's standard high rib (1" min), concealed fastener metal roof system. Include accessories required for weathertight installation.

1. Material and Finish: 26-gauge steel, ASTM A 792 Class AZ50 Galvalume, coated both sides, 0.0187 inches thick.

a. Exterior Surface Finish: Bonderize and provide baked-on primer and factory applied baked-on 70 percent Kynar 500 or Hylar 5000 PVDF fluoropolymer resin based paint coating, with a minimum dry film thickness of 0.7 - 0.8 mil.

1) Color: As selected by Architect from manufacturer’s standard range.

B. Fasteners: Stainless steel screws.

2.3 ROOFING ACCESSORLES

A. Steel Ridge Cap:

1. The cap materials and construction shall match the roof steel materials and construction.

B. Vents: Manufacturer’s standard ventilating ridge vent, and/or low-profile ridge ventilator.

C. Eave Overhang Fascia Flashing: Manufacturer’s standard.

D. Gutters and Downspouts: Provide manufacturer's standard gutters and downspouts sized, fabricated and installed in accordance with SMACNA requirements.

E. Closure Strips: Closed cell, 2 pcf density polyethylene foam, pre-molded to match configuration of roof panels.

2.4 SIDING

A. Manufacturer's standard high rib (1" min), exposed fastener siding panels.

1. Material and Finish: 26 Gauge, ASTM A 653 (A 653 M), Structural Quality, Grade 80 (550) (formerly Grade E), AZ50 (Z180) zinc coating both sides, Triple Spot Test.

a. Exterior Surface Finish:

1) Bonderize and provide baked on primer and factory applied, baked-on 70% Kynar 500 or Hylar 5000 PVDF fluoropolymer resin based Fluropon paint coating as manufactured by Valspar, 0.9 mil minimum dry film thickness.

2) Color: As selected by Architect from manufacturer's standard range.

2. Configuration:

a. Roll-formed; 36-inch 36.02 inch coverage width. Provide panels covering up to 35 foot minimum lengths in single pieces.

b. Factory cut to required length.

c. Factory miter cut gable ends.

d. Fasteners: Color coated No. 10 piercing screws with 1/4-inch 0.24 inch hex head pre-assembled to 1/2-inch (0.51 inch) O.D. dome seal or bond seal stainless steel and EPDM washers.

B. Siding Accessories:

1. Wall Trim and Flashings: Manufacturer's standard wall trim and flashings.

2. Closure Strips: Closed cell, 2 pcf (32 kg/m3) density polyethylene foam, pre-molded to match configuration of wall panels.

2.5 COMPONENTS

A. Man-Doors/Frames

1. Pre-engineered building manufacturer’s standard prefinished uninsulated 3’-0”x7’-0” door/frame.

2. Color: As selected by Architect from manufacturer's standard range.

B. Overhead Sectional Doors

1. Pre-engineered building manufacturer’s standard prefinished uninsulated overhead sectional door.

2. Color: As selected by Architect from manufacturer's standard range.

2.6 INTERIOR FINISH - WALLS AND CEILINGS

A. Steel Panel:

1. Type: 30 Gauge, ASTM A 653 (A 653 M), Structural Quality, Grade 80 (550) (formerly Grade E), galvanized steel with G40 (Z120) zinc coating both sides, Triple Spot Test.

2. Color: White.

2.7 INTERIOR CONCRETE (Including Door Stoops)

A. Floor shall be 8” minimum thickness concrete on 4” compacted CA-6 stone base.

B. Concrete shall be Class PV per IDOT Standards.

C. Saw cuts shall not exceed 12’ each way.

D. Concrete shall be pitched to drain out the overhead doors.

E. Reinforcement shall be wire mesh (6” X 12”) (W6.5 X W4).

F. Finish shall be approved by the owner.

G. Cure-in-Seal shall be applied per manufacturer’s recommendations and written instructions.

2.8 PORCH CONSTRUCTION

A. Floor to be concrete of the same specification as the interior concrete. Concrete to extend 2' beyond the corner posts in each direction.

B. Soffit shall be covered with standard interior liner panel to prevent rodent roosting.

C. Columns shall be wrapped with metal similar to the wall trim of flashing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that site conditions are acceptable for erection/installation of pre-engineered wood building system.

B. Coordinate with responsible entity to perform corrective work on unsatisfactory conditions.

C. Commencement of work by erector/installer is acceptance of site conditions.

3.2 ERECTION- STRUCTURAL FRAMING

A. Erect in accordance with manufacturer's instructions and approved shop drawings.

B. Provide temporary erection and wind load bracing to maintain structure plumb and in alignment until installation of permanent bracing and/or roofing and wall coverings are completed.

C. Do not field cut or alter structural members without approval of Architect and manufacturer.

3.3 INSTALLATION

A. Erect building per manufacturer's instructions and sequencing.

B. Metal Roofing:

1. General: Install in accordance with manufacturer's instructions. Secure to structural framing aligned, level and plumb. Space fasteners as shown on Erection Drawings.

2. Sidelap: Minimum one full corrugation.

3. Endlap: 12 inches for slopes 2 inch 12 to 4 inch 12. Secure together over and to structural members.

END OF SECTION 13 34 00

DIVISION 13 - SPECIAL CONSTRUCTION
SECTION 13 34 19 - METAL BUILDING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated structural steel building frame.

B. Insulated Metal wall and roof panels including soffits, gutters and downspouts, and roof mounted equipment curbs.

C. Exterior windows and louvers.

1.2 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between accessory components and wall system.

B. Section 08 11 13 - Hollow Metal Doors and Frames: Hollow metal doors.

C. Section 083323 - Overhead Coiling Doors.

D. Section 08 80 00 - Glazing.

1.3 REFERENCE STANDARDS

A. AISC 360 - Specification for Structural Steel Buildings; 2022.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021a.

E. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2019.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

G. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2022.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

J. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.

K. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2022.

L. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

M. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

N. MBMA (MBSM) - Metal Building Systems Manual; 2012.

O. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections; wall and roof system dimensions, panel layout, general construction details, anchors and methods of anchorage, and installation; framing anchor bolt settings, sizes, locations from datum, and foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.

1. Final Foundation Loads shall be provided as nominal, unfactored loads for each load case at each column.

C. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement.

D. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.

1. Show roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, and items mounted on roof curbs.

2. Show wall-mounted items including doors, windows, louvers, and lighting fixtures.

E. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:

1. Flashing and trim.

2. Gutters.

3. Downspouts.

4. Windows.

5. Louvers.

F. Samples for Initial Selection: For each type of metal building system, from manufacturer.

G. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

1.5 QUALITY ASSURANCE

A. Designer Qualifications: Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this type of work.

1. Design Engineer Qualifications: Licensed in the State in which the Project is located.

2. Comply with applicable code for submission of design calculations as required for acquiring permits.

3. Cooperate with regulatory agency or authorities having jurisdiction (AHJ), and provide data as requested.

B. Perform work in accordance with AISC 360 and MBMA (MBSM).

C. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.

1. Not less than three years of documented experience.

D. Erector Qualifications: Company specializing in performing the work of this section approved by manufacturer.

E. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

1.6 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

D. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Buildings Systems - Basis of Design:

1. American Buildings: www.americanbuildings.com/#sle

B. Other Manufacturers:

1. Butler Manufacturing Company: www.butlermfg.com/#sle.

2. Ceco Building Systems: www.cecobuildings.com/#sle.

3. Chief Buildings: www.chiefbuildings.com/#sle.

4. Heritage Building Systems: www.heritagebuildings.com/#sle

5. VP Buildings: www.vp.com/#sle.

2.2 ASSEMBLIES

A. Single span rigid frame.

B. Primary Framing: Rigid frame of rafter beams and columns, canopy beams, and wind bracing.

C. Secondary Framing: Purlins, and other items detailed.

D. Wall System: Preformed metal panels of vertical profile, with sub-girt framing/anchorage assembly, and accessory components.

E. Roof System: Preformed metal panels oriented parallel to slope, with sub-girt framing/anchorage assembly, insulation, and liner panels, and accessory components.

F. Roof Slope: As indicated on the drawings.

2.3 PERFORMANCE REQUIREMENTS

A. Installed Thermal Resistance of Wall System: R-value of R-13 + R-13ci.

B. Installed Thermal Resistance of Roof System: R-value of R-19 + R-11 Liner System.

C. Design structural members to withstand dead load, applicable snow load, and design loads due to pressure and suction of wind calculated in accordance with applicable code.

1. See also applicable Design Criteria and General Structural Notes in the Drawings.

D. Exterior roof system shall withstand imposed loads with maximum allowable vertical deflection of 1/180 of span.

E. Exterior wall system shall withstand imposed loads with maximum allowable horizontal deflection of 1/180 of span.

F. Building framing system shall withstand imposed lateral loads with a maximum allowable drift of 1/240 of the height of the building.

G. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

H. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of ____ degrees F.

2.4 MATERIALS - FRAMING

A. Structural Steel Members: ASTM A36/A36M.

B. Structural Tubing: ASTM A500/A500M Grade C cold-formed.

C. Plate or Bar Stock: ASTM A529/A529M, Grade 50.

D. Anchor Bolts: ASTM F1554, Grade 36, Class 1A, with no preference for protective coating.

E. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1; galvanized to ASTM A153/A153M.

F. Welding Materials: Perform in accordance with AWS D1.1/D1.1M.

G. Primer: SSPC-Paint 20 zinc rich.

2.5 MATERIALS - WALLS AND ROOF

A. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Designation SS (structural steel), Grade 33 (230), with G90/Z275 coating.

B. Steel Sheet: ASTM A792/A792M aluminum-zinc alloy coated to AZ50/AZM150.

C. Metal Building Type, Factory Applied, Vapor-Barrier Insulation Facings: Water vapor permeance no greater than 0.10 perm when tested in accordance with ASTM E96/E96M; flame spread index of 25 or less, and smoke developed index of 40 or less when tested in accordance with ASTM E84.

1. Manufacturers:

a. a. Thermal Design, Inc; Simple Saver System..

b. b. Silvercote, LLC; Energy Saver FP..

D. Joint Seal Gaskets: Manufacturer's standard type.

E. Fasteners: Manufacturer's standard type, galvanized to comply with requirements of ASTM A153/A153M, finish to match adjacent surfaces when exterior exposed.

F. Bituminous Paint: Asphaltic type.

G. Sealant: Manufacturer's standard type.

H. Trim, Closure Pieces, Caps, Flashings, Gutters, Downspouts, Rain Water Diverter, Fascias, and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

2.6 COMPONENTS

A. Frames: Manufacturer's standard.

B. Doors: See Section 08 11 13.

C. Overhead Doors: See Section 08 36 13.

D. Windows: Manufacturer's standard.

1. Glass and Glazing: See Section 08 80 00.

E. Unit Skylight: Manufacturer's standard.

1. Double Dome: Acrylic plastic,; Manufacturer's standard thickness; air seal the space:

a. Outer Dome: White translucent.

b. Inner Dome: Clear.

2. Nominal Size: See drawings.

3. Configuration: Single units.

4. Shape: Convex.

5. Unit Frame: Extruded aluminum thermally broken, integral curb frame and counterflashing, with integral condensation drainage gutter.

6. Support Curb: Aluminum sandwich construction; minimum 12 inches high, fibrous glass insulated, with flange for anchorage to roof deck, counterflashed and formed to roofing metal with manufacturer's standard cricket.

2.7 FABRICATION - FRAMING

A. Fabricate members in accordance with AISC 360 for plate, bar, tube, or rolled structural shapes.

B. Provide wall opening framing for doors, windows, and other accessory components.

2.8 FABRICATION - WALL AND ROOF PANELS

A. Siding: Minimum 24 gauge metal thickness, R-Panel profile, 1 1/4" inch deep, lapped edges fitted with continuous gaskets.

B. Roofing: Minimum 24 gauge metal thickness, Standing Seam II profile, lapped edges fitted with continuous gaskets.

C. Soffit Panels: Minimum 24 gauge metal thickness, flat profile indicated, perforated for ventilation.

D. Girts/Purlins: Rolled formed structural shape to receive siding, roofing and liner sheet.

E. Internal and External Corners: Same material thickness and finish as adjacent material, profile brake formed to required angles. Back brace mitered internal corners with 24 gauge thick sheet.

F. Expansion Joints: Same material and finish as adjacent material where exposed, 24 gauge thick, manufacturer's standard brake formed type, of profile to suit system.

G. Flashings, Closure Pieces, Fascia: Same material and finish as adjacent material, profile to suit system.

H. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive type.

2.9 FABRICATION - GUTTERS AND DOWNSPOUTS

A. Fabricate of same material and finish as roofing metal.

B. Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion at joints.

C. Fabricate support straps of same material and finish as roofing metal, color as selected.

2.10 FINISHES

A. Framing Members: Clean, prepare, and shop prime. Do not prime surfaces to be field welded.

B. Exterior Surfaces of Wall Components and Accessories: Precoated enamel on steel of modified silicone finish, color as selected from manufacturer's standard range.

C. Interior Surfaces of Wall Components and Accessories: Precoated enamel on steel of modified silicone finish, color as selected from manufacturer's standard range.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3.2 ERECTION - FRAMING

A. Erect framing in accordance with AISC 360.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.3 ERECTION - WALL AND ROOF PANELS

A. Install in accordance with manufacturer's instructions.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Fasten cladding system to structural supports, aligned level and plumb.

D. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

E. Provide expansion joints where indicated.

F. Use concealed fasteners.

G. Install sealant and gaskets, providing weather tight installation.

3.4 ERECTION - GUTTERS AND DOWNSPOUTS

A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.

B. Slope gutters minimum 0.05 inch/ft.

C. Install splash pans under each downspout.

3.5 ERECTION - SKYLIGHTS

A. Install in accordance with manufacturer's instructions.

B. Coordinate with installation of roofing system and related flashings.

C. Seal between skylight units and roof system, providing weather tight installation.

3.6 INSTALLATION - ACCESSORY COMPONENTS IN WALL SYSTEM

A. Install door frames and windows and glass in accordance with manufacturer's instructions.

3.7 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

B. Siding and Roofing: 1/8 inch from true position.

END OF SECTION 13 34 19

DIVISION 21 - FIRE SUPPRESSION

SECTION 21 05 00 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Above ground piping.

B. Escutcheons.

C. Mechanical couplings.

D. Pipe hangers and supports.

1.2 SUBMITTALS

A. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.

B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

C. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section.

1. Minimum three years experience.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Sprinkler-based System:

1. Comply with NFPA 13.

2. See Section 21 13 00.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.2 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A795 Schedule 40, black.

1. Steel Fittings: ASME B16.5 steel flanges and fittings.

2. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.3 ESCUTCHEONS

A. Manufacturers:

1. Fire Protection Products, Inc: www.fppi.com/#sle.com/#sle.

2. Tyco Fire Protection Products: www.tyco-fire.com/#sle.

3. Viking Group Inc: www.vikinggroupinc.com/#sle.

B. Material:

1. Metals and Finish: Comply with ASME A112.18.1.

C. Construction:

1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.

2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.4 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

F. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.5 MECHANICAL COUPLINGS

A. Manufacturers:

1. Anvil International: www.anvilintl.com/#sle.

2. Tyco Fire Protection Products: www.tyco-fire.com/#sle.

3. Victaulic Company; FireLock Style 009H: www.victaulic.com/#sle.

B. Rigid Mechanical Couplings for Grooved Joints:

1. Dimensions and Testing: Comply with AWWA C606.

2. Minimum Working Pressure: 300 psig.

3. Housing Material: Fabricate of ductile iron complying with ASTM A536.

4. Housing Coating: Factory applied orange enamel.

5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.

6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

END OF SECTION 21 05 00

DIVISION 21 - FIRE SUPPRESSION
SECTION 21 13 00 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. Dry-pipe sprinkler system.

C. System design, installation, and certification.

1.2 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; Current Edition.

B. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

C. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.3 SUBMITTALS

A. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

B. Shop Drawings:

1. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.

2. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.

C. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.

2. Sprinkler Wrenches: For each sprinkler type.

1.4 QUALITY ASSURANCE

A. Comply with UL (DIR) requirements.

B. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State of Illinois.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sprinklers, Valves, and Equipment:

1. Anvil International; _____: www.anvilintl.com/#sle.

2. Tyco Fire Protection Products; _____: www.tyco-fire.com/#sle.

3. Viking Corporation; _____: www.vikinggroupinc.com/#sle.

2.2 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building.

B. Occupancy: Ordinary hazard, Group 2; comply with NFPA 13.

C. Water Supply: Determine volume and pressure from water flow test data.

D. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.3 SPRINKLERS

A. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.

1. Response Type: Quick.

2. Coverage Type: Extended.

3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

B. Exposed Area Type: Upright type.

1. Response Type: Quick.
2. Coverage Type: Extended.
3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

2.4 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:

1. Activate electric alarm.
2. Test and drain valve.

B. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm, accelerator, and with the following additional capabilities and features:

1. Activate electric alarm.
2. Test and drain valve.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Place pipe runs to minimize obstruction to other work.

D. Place piping in concealed spaces above finished ceilings.

E. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

F. Flush entire piping system of foreign matter.

G. Hydrostatically test entire system.

H. Require test be witnessed by Authority Having Jurisdiction.

3.2 SCHEDULES

A. System Hazard Areas:

1. Offices: Light Hazard.

2. Vehicle Storage: Ordinary Hazard, Group 2.

END OF SECTION 21 13 00

DIVISION 22 - PLUMBING

SECTION 22 05 17 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe sleeves.

1.2 RELATED REQUIREMENTS

A. Section 22 07 19 - Plumbing Piping Insulation.

1.3 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2013.

B. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

PART 2 PRODUCTS

2.1 PIPE SLEEVES

A. Vertical Piping:

1. Sleeve Length: 1 inch above finished floor.

2. Provide sealant for watertight joint.

B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Pipe Passing Through Below Grade Exterior Walls:

1. Zinc coated or cast iron pipe.

2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Clearances:

1. Provide allowance for insulated piping.

2. Wall, Floor, Partitions, and Beam Flanges: 1 inch greater than external pipe diameter.

3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.

PART 3 EXECUTION

3.1 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.

2. Aboveground Piping:

a. Pack solid using mineral fiber complying with ASTM C592.

b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.

E. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

END OF SECTION 22 05 17

DIVISION 22 - PLUMBING

SECTION 22 05 19 - METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Thermometers.

1.2 REFERENCE STANDARDS

A. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.

B. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014, with Editorial Revision (2017).

PART 2 PRODUCTS

2.1 DIAL THERMOMETERS

A. Thermometers - Adjustable Angle: Dial type bimetallic actuated; ASTM E1; stainless steel case, adjustable angle with front recalibration, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.

END OF SECTION 22 05 19

DIVISION 22 - PLUMBING
SECTION 22 05 23 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ball valves.

B. Check valves.

1.2 RELATED REQUIREMENTS

A. Section 22 07 19 - Plumbing Piping Insulation.

B. Section 22 10 05 - Plumbing Piping.

1.3 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013.

B. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2017.

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.

D. ASME B16.34 - Valves - Flanged, Threaded and Welding End; 2017.

E. ASME B31.9 - Building Services Piping; 2014.

F. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.

G. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.

H. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

I. NSF 61 - Drinking Water System Components - Health Effects; 2024.

J. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.4 SUBMITTALS

A. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.5 QUALITY ASSURANCE

A. Manufacturer:

1. Obtain valves for each valve type from single manufacturer.

PART 2 PRODUCTS

2.1 APPLICATIONS

A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

B. Provide the following valves for the applications if not indicated on drawings:

1. Shutoff: Ball

2. Swing Check (Pump Outlet):

a. 2 inch and Smaller: Bronze swing check valves with bronze or nonmetallic disc.

C. Required Valve End Connections for Non-Wafer Types:

1. Copper Tube:

a. 2 inch and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

D. Domestic, Hot and Cold Water Valves:

1. 2 inch and Smaller:

a. Bronze and Brass: Provide with solder-joint or threaded ends.

b. Ball: Two piece, full port, brass with brass trim.

c. Bronze Swing Check: Class 125, bronze disc.

2.2 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:

1. Hand Lever: Quarter-turn valves 6 inch and smaller except plug valves.

D. Insulated Piping Valves: With 2 inch stem extensions and the following features:

1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Valve-End Connections:

1. Solder Joint Connections: ASME B16.18.

F. General ASME Compliance:

1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.

2. Solder-joint Connections: ASME B16.18.

G. Potable Water Use:

1. Certified: Approved for use in compliance with NSF 61 and NSF 372.

2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

H. Source Limitations: Obtain each valve type from a single manufacturer.

2.3 BRASS, BALL VALVES

A. Two Piece, Full Port with Brass Trim and Solder Connections:

1. Comply with MSS SP-110.

2. WSP Rating: 150 psi.

3. WOG Rating: 600 psi.

4. Body: Forged brass.

5. Seats: PTFE.

6. Ball: Chrome-plated brass.

7. Operator: Lockable handle and memory stop.

2.4 BRONZE, SWING CHECK VALVES

A. General:

1. Fabricate from dezincification resistant material.

2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125:

1. Pressure and Temperature Rating: MSS SP-80, Type 3.

2. Design: Y-pattern, horizontal or vertical flow.

3. WOG Rating: 200 psi.

4. Body: Bronze, ASTM B62.

5. End Connections: Threaded.

6. Disc: Bronze.

PART 3 EXECUTION

3.1 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.2 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Install check valves where necessary to maintain direction of flow as follows:

1. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION 22 05 23

DIVISION 22 - PLUMBING

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 Section Includes

A. Beam clamps.

B. Pipe hangers.

C. Pipe supports, guides, shields, and saddles.

1.2 Reference Standards

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General - Purpose Piping; 2014.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2014).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2014).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

M. FM (AG) - FM Approval Guide; current edition.

N. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

O. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

P. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 Administrative Requirements

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.

2. Coordinate the work with other trades to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.

4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.

1.4 Quality Assurance

A. Comply with applicable building code.

PART 2 PRODUCTS

2.1 General Requirements

A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.

B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.

C. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.

1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.

2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.

D. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

2.2 Beam Clamps

A. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.

B. C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.

C. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.

D. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.

E. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

F. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.3 Pipe Hangers

A. Swivel Ring Hangers, Adjustable:

1. MSS SP-58 type 10, epoxy-painted, zinc-colored.

2. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

3. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.

B. Clevis Hangers, Adjustable:

1. Copper Tube: MSS SP-58 type 1, epoxy-plated copper.

2.4 Pipe Supports, Guides, Shields, and Saddles

A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

B. Pipe Shields for Insulated Piping:

1. MSS SP-58 type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

2. General Construction and Requirements:

a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.

b. Shields Material: UV-resistant polypropylene with glass fill.

c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.

d. Service Temperature: Minus 40 to 178 degrees F.

e. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

C. Pipe Supports:

1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2. Liquid Temperatures Up to 122 degrees F:

a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.

b. Support From Below: MSS SP-58 types 35 through 38.

D. Pipe Supports, Thermal Insulated:

1. General Requirements:

a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.

c. Provide pipe supports for 1/2 to 30 inch iron pipes.

d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.

2. PVC Jacket:

a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.

b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.

c. Minimum Thickness: 60 mil, 0.06 inch.

PART 3 EXECUTION

3.1 Installation

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

G. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.

2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners according to manufacturer's recommended torque settings.

I. Remove temporary supports.

END OF SECTION 22 05 29

DIVISION 22 - PLUMBING
SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe markers.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007 (ANSI/ASME A13.1).

1.3 SUBMITTALS

A. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Piping: Pipe markers.

2.2 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com.
2. Brimar Industries, Inc.: www.pipemarker.com.
3. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
4. MIFAB, Inc.: www.mifab.com.
5. Seton Identification Products: www.seton.com.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install plastic pipe markers in accordance with manufacturer's instructions.

END OF SECTION 22 0553 22 05 53

DIVISION 22 - PLUMBING
SECTION 22 07 19 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

1.3 REFERENCE STANDARDS

A. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2017.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

D. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, UL 723, ASTM E84, or UL 723.

2.2 GLASS FIBER

A. Manufacturers:

1. Johns Manville Corporation; Micro-Lok: www.jm.com.

2. Knauf Insulation; 1000 Degree Pipe Insulation: www.knaufusa.com.

3. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com/#sle.

B. Insulation: ASTM C547and ASTM C795; rigid molded, noncombustible.

1. 'K' value: ASTM C177,.23 at 75 degrees F.

2. Maximum Service Temperature: 850 degrees F.

3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

D. Vapor Barrier Lap Adhesive: Compatible with insulation.

E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

F. Indoor Vapor Barrier Finish:

1. Cloth: Untreated; 9 oz/sq yd weight.

2. Vinyl emulsion type acrylic, compatible with insulation, black color.

G. Insulating Cement: ASTM C449.

2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:

1. Aeroflex USA, Inc: www.aeroflexusa.com.

2. Armacell LLC: www.armacell.us.

3. K-Flex USA LLC: www.kflexusa.com.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 3; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F.

2. Maximum Service Temperature: 220 degrees F.

3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested and is free of defects before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install insulation with longitudinal seams at top and bottom of horizontal runs.

C. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

D. Keep insulation materials dry during application and finishing.

E. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

F. Install insulation with least number of joints practical.

G. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

H. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

I. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

L. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.

2. Testing agency labels and stamps.

3. Nameplates and data plates.

4. Cleanouts.

Q. Inserts and Shields:

1. Application: Piping 1-1/2 inches diameter or larger.

2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

3. Insert Location: Between support shield and piping and under the finish jacket.

4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

R. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

3.3 SCHEDULES

A. Plumbing Systems:

1. Domestic Hot and cold Water Supply:

a. Glass Fiber Insulation:

1) Thickness: 1 inch

b. Flexible Elastomeric Insulation:

1) Thickness: 1 inch.

END OF SECTION 22 07 19

DIVISION 22 - PLUMBING
SECTION 22 10 05 - PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.

1. Sanitary sewer.

2. Domestic water.

3. Gas.

4. Flanges, unions, and couplings.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

C. Section 22 07 19 - Plumbing Piping Insulation.

1.3 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.

B. ASME B16.5 - Pipe Flanges and Flanged Fittings; 2013.

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.

D. ASME B16.20 - Metallic Gaskets for Pipe Flanges: Ring-Joint, Spiral-wound, and Jacketed; 2012.

E. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

F. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; 2016.

G. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; 2012.

H. ASME B16.39 - Malleable Iron Threaded Pipe Unions; 2014.

I. ASME B18.2.1 - Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws; 2012.

J. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

K. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2017.

L. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.

M. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

N. ASTM B75/B75M - Standard Specification for Seamless Copper Tube; 2011.

O. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

P. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2013.

Q. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.

R. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.

S. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014.

T. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.

U. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.

V. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2016.

W. ASTM A-536 - Ductile Iron Castings

X. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2009 (Revised 2012).

Y. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2011 (Revised 2012).

Z. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).

AA. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

BB. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

CC. NFPA 54 - Natural Fuel Gas Code; National Fire Protection Association; 2015.

DD. NSF 61 - Drinking Water System Components - Health Effects; 2024.

EE. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.4 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.7 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.2 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight (within vehicle storage area).

1. Fittings: Cast iron.

2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. PVC Pipe: ASTM D2665 or ASTM D3034.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.3 SANITARY SEWER PIPING, ABOVE GRADE

A. PVC Pipe: ASTM D2665.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.4 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Tube: ASTM B88, annealed.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

2. Joints: ASTM B32, alloy Sn95 solder.

3. Joints: AWS A5.8M/A5.8, BCuP copper/silver braze.

2.5 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

2. Joints: ASTM B32, alloy Sn95 solder.

3. Joints: Grooved mechanical couplings.

4. Mechanical Press Sealed Fittings: Double pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, non toxic synthetic rubber sealing elements.

a. Manufacturers:

1) Viega LLC.

2) Elkhart Products Corp.

3) Nibco.

5. Appurtenances for Grooved-End Copper Tubing:

a. Manufacturers: Subject to compliance with requirements, provide products by the following:

1) Anvil International

2) Grinnell

3) Victaulic Company.

b. Bronze Fittings for Grooved-End, Copper Tubing: ASTM B 75 (ASTM B 75M) copper tube or ASTM B 584 bronze castings.

c. Mechanical Couplings for Grooved-End Copper Tubing:

1) Copper-tube dimensions and design similar to AWWA C606.

2) Ferrous housing sections.

3) EPDM-rubber gaskets suitable for hot and cold water.

4) Stainless steel bolts and nuts.

5) Minimum Pressure Rating: 300 psig.

B. CPVC Pipe: ASTM D2846/D2846M, ASTM F441/F441M, or ASTM F442/F442M(for non-potable water).

1. Fittings: CPVC; ASTM D2846/D2846M, ASTM F437, ASTM F438, or ASTM F439.

2. Joints: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement.

2.6 NATURAL GAS PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

B. Polyethylene Pipe: ASTM D2513, SDR 11.

1. Fittings: ASTM D2683 or ASTM D2513 socket type.

2. Joints: Fusion welded.

2.7 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

2.8 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.

2. Joints: Threaded or welded to ASME B31.1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Provide access where valves and fittings are not exposed.

H. Excavate in accordance with Section 31 23 16.

I. Backfill in accordance with Section 31 23 23.

J. Install bell and spigot pipe with bell end upstream.

K. Install valves with stems upright or horizontal, not inverted.

L. Install water piping to ASME B31.9.

M. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

N. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

O. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

P. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

Q. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

R. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.

S. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

T. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

U. Install dielectric pipe nipples in piping at connections of dissimilar metal piping and tubing.

V. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

W. Sleeve pipes passing through partitions, walls and floors.

3.4 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.

2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.

d. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 ADJUSTING

A. Perform the following adjustments before operation:

1. Open shutoff valves to fully open position.

2. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

a. Adjust calibrated balancing valves to flows indicated.

3. Remove plugs used during testing of piping and for temporary sealing of piping during installation.

3.7 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Clean and disinfect potable domestic water piping in accordance with the Illinois Plumbing Code.

END OF SECTION 22 1005 22 10 05

DIVISION 22 - PLUMBING
SECTION 22 10 06 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Drains.

B. Cleanouts.

C. Hose bibbs.

D. Washing machine boxes and valves.

E. Backflow preventers.

F. Water hammer arrestors.

G. Mixing valves.

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping.

B. Section 22 30 00 - Plumbing Equipment.

C. Section 22 40 00 - Plumbing Fixtures.

1.3 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor and Trench Drains; 2016.

B. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.

C. NSF 61 - Drinking Water System Components - Health Effects; 2024.

D. NSF 372 - Drinking Water System Components - Lead Content; 2022.

E. PDI-WH 201 - Water Hammer Arresters; 2010.

1.4 SUBMITTALS

A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.2 DRAINS

A. Refer to plumbing drawings for requirements.

2.3 CLEANOUTS

A. Refer to plumbing drawings for requirements.

B. HOSE BIBBS

1. Refer to plumbing drawings for requirements.

C. WASHING MACHINE BOXES AND VALVES

D. Refer to plumbing drawings for requirements.

1. BACKFLOW PREVENTERS

E. Refer to plumbing drawings for requirements.

2.4 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Refer to plumbing drawings for requirements.

1. WATER HAMMER ARRESTORS

2. Manufacturers:

a. Jay R. Smith Manufacturing Company; _____: www.jayrsmith.com/#sle.

b. Watts Regulator Company, a part of Watts Water Technologies; _____: www.wattsregulator.com/#sle.

c. Zurn Industries, LLC; _____: www.zurn.com/#sle.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved portable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

F. Pipe relief from backflow preventer to nearest drain.

G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks or washing machine outlets.

END OF SECTION 22 10 06

DIVISION 22 - PLUMBING
SECTION 22 30 00 - PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Commercial gas-fired water heaters.

B. In-line circulator pumps.

1.2 SUBMITTALS

A. Product Data:

1. Provide electrical characteristics and connection requirements.

B. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.1 WATER HEATERS

A. Refer to plumbing plans for requirements.

2.2 IN-LINE CIRCULATOR PUMPS

A. Refer to plumbing plans for requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.

C. Pumps:

1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION 22 30 00

DIVISION 22 - PLUMBING
SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water closets.

B. Urinals.

C. Lavatories.

D. Kitchen sinks.

E. Laundry tubs.

F. Service sinks.

G. Showers.

H. Emergency showers.

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping.

B. Section 22 10 06 - Plumbing Piping Specialties.

C. Section 22 30 00 - Plumbing Equipment.

1.3 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2014.

C. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2017.

D. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2015.

E. NSF 61 - Drinking Water System Components - Health Effects; 2024.

F. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.4 SUBMITTALS

A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Manufacturer's Instructions: Indicate installation methods and procedures.

C. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 PRODUCTS

2.1 GENERAL

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.2 FLUSH VALVE WATER CLOSETS

A. Refer to plumbing plans for requirements.

1. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.

2.3 WALL HUNG URINALS

A. Refer to plumbing plans for requirements.

2.4 LAVATORIES

A. Refer to plumbing plans for requirements.

2.5 SINKS

A. Refer to plumbing plans for requirements.

2.6 SHOWERS

A. Refer to plumbing plans for requirements.

2.7 SERVICE SINKS

A. Refer to plumbing plans for requirements.Service Sink Manufacturers:

2.8 EMERGENCY SHOWERS

A. Refer to plumbing plans for requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install floor-mounted water closets on closet flange attachments to drainage piping.

E. Install and secure fixtures in place with wall supports and bolts.

F. Install counter-mounting fixtures in and attached to casework.

3.4 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

A. Clean plumbing fixtures, equipment, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

3.7 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 22 40 00

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 230010 - MECHANICAL GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 GENERAL

A. All work under this section shall comply with the contract requirements noted on the architectural drawings and/or specifications and shall include all mechanical sections specified herein. All work under this section shall comply with the contract requirements noted on architectural drawings and specifications general requirements.

B. All cavity spaces between ceiling and structure (plenum spaces) are to be considered return air plenums and all material installed in plenum shall be rated and UL listed for return air plenums.

C. Mechanical contractor shall schedule start-up session to start HVAC equipment. Schedule one full day of start-up at least two weeks prior to substantial completion.

1.2 RELATED REQUIREMENTS

A. Section 019113 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

1.3 WORK INCLUDED

A. Provide all labor, materials, equipment and tools required for completely finished and operational HVAC and mechanical systems to fulfill the design intent shown on the documents.

B. Work shall be of the finest quality of construction, materials and workmanship.

C. Install equipment in accordance with manufacturer recommendations.

D. Section 01 91 13 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

1. Commissioning agent is engaged to document the completion of the mechanical, life safety, and building control systems for the project. Section defines the role of each member of the commissioning team.

2. Comply with the requirements of Division 1 for the commissioning of the various building systems.

E. The plans are diagrammatic and generally show the locations of fixtures, equipment, ductwork and piping and shall not be scaled. Provide all offsets, fittings and components required for a complete system even if not explicitly called out on the drawings.

1.4 COORDINATION AND VERIFICATION

A. Refer to the architectural interior details, floor plans, elevations and other contract drawings as well as existing structural, mechanical, fire protection, electrical systems and other existing conditions. Coordinate work with that of the other trades to avoid interference.

B. All dimensions and existing conditions shall be field verified prior to the commencement of the work.

C. Contract Documents:

1. General: The Contract Documents are diagrammatic, showing certain physical relationships which must be established within the mechanical work and its interface with other work. Such establishment is the exclusive responsibility of the Contractor. Drawings shall not be scaled for the purpose of establishing material quantities.

2. When electronic CAD files or building information modeling (BIM) files have been provided to the contractor, the contractor shall only consider the files as design to only show the intent of the design. The contractor shall be responsible for the Coordination drawings based on the design.

3. Work out all “tight” conditions in advance of installation. If necessary, and before work proceeds in those areas, prepare coordination drawings showing all work in congested areas. Provide additional work necessary to overcome congested conditions at no increase in contract sum or schedule.

4. Clearly indicate solutions to space problems. Identification of space problems without solutions is not acceptable. Only areas clearly identified will be reviewed.

5. Acceptance by the Architect/Engineer does not imply acceptance of any deviations from contract documents requirements or acceptance of uncoordinated work. Review is for general conformance to the design concept and general compliance with the information given in the contract documents.

6. Locate equipment requiring periodic servicing so that it is readily accessible. Provide means of service access, following appropriate manufacturer's recommended service clearance space or, as applicable, means of access using duct, wall, or ceiling access doors.

7. Install ductwork and piping to leave sufficient space for AHJ inspection of wall construction.

8. Supplemental Instructions: The exact location for some items in this Specification may not be shown on the Drawings. The location of such items may be established by the Engineer during the progress of the work.

9. If prevented by project conditions, prepare drawings showing proposed rearrangement of Work, including changes to Work specified in other sections. Obtain permission of Architect before proceeding.

10. Discrepancies:

    a. Examine Drawings and Specifications.

    b. Report any discrepancies to the Architect and obtain written instructions before proceeding.

    c. Should there be a conflict within or between the Specifications or Drawings, the more stringent or higher quality requirements shall apply.

    d. Items called for in either specifications or drawings shall be required as if called for in both.

    e. Be responsible for providing proper documentation of equipment product data and shop drawings to all entities providing service.

1.5 UTILITY DISRUPTIONS

A. Existing buildings and their facilities must remain functional while the Work under this Contract is performed. All system shutdowns and outages must be minimized, provided with temporary heating or cooling systems as part of the base bid and coordinated with the Owner.

B. Cause as little interference or interruption of existing utilities and services as possible. Schedule work which will cause interference or interruption a minimum of two weeks in advance with Owner, authorities having jurisdiction, and all affected trades.

C. The Contractor shall provide temporary or new services to all existing facilities and utility streams as required to maintain their proper operation when normal services are disrupted as a result of the work being accomplished under this project.

D. The time allowed for outages will not be during normal working hours unless otherwise approved by the Owner. All costs of outages, including any overtime charges for night and weekend work, and temporary systems shall be included in the contract amount.

1.6 CODES, REGULATIONS, FEES, PERMITS

A. Conform to the codes in force at the time of construction in the jurisdiction of the project.

B. Call for inspections from the authority having jurisdiction. If discrepancies exist between the contract documents and the local requirements, the more stringent shall apply.

C. Contractor shall obtain all required permits prior to the start of the project.

D. Post permits as required.

E. Contractor shall pay all permit fees, tap fees and inspection fees. Owner shall pay any required development fees.

1.7 PROTECTION

A. People

1. Comply with all applicable health and safety regulations. Set barricades and signs as necessary to minimize hazards for building occupants and trades.

2. Equipment, materials or other potential hazards to the public and working occupants of the building shall not be left overnight outside of the designated working or construction areas.

B. Work

1. Take all necessary measure to protect the work during and after installation to ensure that it will be unblemished, undamaged and clean when turned over to the owner.

C. Mechanical Systems

1. All specified filters shall be installed in air handling equipment prior to startup. Provide additional sets of filters during construction as required to maintain cleanliness of system.

2. In addition to specified filters, install a roughing filter upstream of mixed air filter. Roughing filter shall consist of two layers of roll filter media clipped and sealed to entering side of filter frame. Change roughing filter as necessary to minimize dust collection on specified filters.

3. Replace filters in existing and new mechanical equipment that was in use during construction prior to turn-over to owner.

4. During periods of excessive dust generation such as drywall sanding, seal off return and exhaust openings and grilles to prevent dust from accumulating in ductwork.

5. If outside air source contains less dust than building air, adjust A/C unit dampers to operate with as much outside air as possible without causing a freezing condition for coil or exceeding capacity of coil to adequately condition supply air.

6. Do not operate any air handling unit without all temporary construction filters, and scheduled filters installed.

7. Replace filters in existing and new mechanical equipment that was in use during construction prior to turn-over to owner.

D. Equipment and Materials

1. Deliver equipment in its original unbroken package to prevent damage or entrance of foreign matter. Perform all handling and shipping in accordance with manufacturer's recommendations. Provide protective coverings during construction. Identifying labels intact and legible.

2. Immediately upon delivery, identify and inspect materials and equipment delivered to Site to assure compliance with Contract Documents, approved submittals and reviewed Shop Drawings.

3. Protect from loss, damage, dust, water, etc., until notice of completion has been filed. Promptly replace lost, damaged or defective materials and equipment with new at no increase in Contract Sum. Remove damaged or defective materials from site.

4. Do not store equipment or materials outdoors unprotected. Remove improperly stored equipment and materials from site. Contractor shall provide storage in appropriate enclosed wharehouse as required at contractors expense.

5. Ductwork and piping shall be delivered to site with ends sealed. Seal shall remain in place until installed. Provide seal on end of all open ductwork and piping at end of day.

6. Refer to Division 1 for additional requirements.

1.8 OWNER-FURNISHED EQUIPMENT

A. All equipment called out in the Specifications or shown on the Drawings as "Owner-Furnished Equipment" or equipment furnished by other Divisions shall be installed and connected under this Contract. Provide all connection components as required, including but not limited to, reducers, pressure regulators, back-flow preventers, flexible connectors, unions, gauges, thermometers, and isolation valves as required by manufacturer's installation requirements or contract document details. Provide rough-ins for all future connections indicated.

1.9 CUTTING AND PATCHING

A. Cut and patch as necessary for the installation of the materials and equipment. Coordinate patching with the architectural contractor.

B. Do not cut any structural members without prior approval from the architect or structural engineer.

1.10 OPERATION AND MAINTENANCE MANUAL

A. Refer to Division 01 for O&M Manual requirements. Provide most stringent between items noted below and in Division 1. If there are no requirements in Division 1, the requirements below shall apply.

B. Upon substantial completion of the work, submit one O&M Manual to the engineer for review and comment. Respond to comments and submit a total of 3 copies of the O&M Manual to the architect upon project completion.

C. Manual shall be in a 3-ring binder with edge and front labels. Include a table of contents and include:

1. Final approved submittals indicating all model numbers, serial numbers, cut sheets, and all performance criteria on furnished equipment

2. Installation, Operation and Maintenance Instructions

3. Parts Lists

4. Test and Balance Report

5. Certificates of Inspection

6. Executed Warranties

D. Provide PDF format copy of O&M manual as noted above. PDF shall be bookmarked with titles per specification section and per piece of equipment within each section.

1.11 WARRANTIES

A. Provide a one year warranty on all mechanical work installed under contract. Provide an additional 4 year warranty for all refrigerant compressors installed.

B. Include executed warranties in O&M Manual.

C. Warranty shall include parts, labor, and shipping and shall cover any damage caused by failures in the covered mechanical systems.

1.12 RECORD DRAWINGS

A. Refer to Division 01 for requirements. At a minimum comply with the following requirements.

B. Maintain a set of redlined drawings at the jobsite with all changes to the Contract Documents, whether generated by addenda, change orders, or field conditions, and dimensioned locations of underground utilities. Maintain a daily record of these changes and keep current set of drawings showing these changes. Submit set of redlined drawings to the owner at project close-out.. Record changes and locations of installed systems drawn to scale and fully dimensioned, and as specified in Division 1, but a minimum of:

1. Work concealed behind or within other work, in an inaccessible arrangement.

2. Mains and branches of piping systems:

a. With valves and control devices located and numbered.

b. With concealed unions located.

c. With items requiring maintenance located (traps, strainers, expansion compensators, tanks, etc.) and clearly labeled..

3. Underground piping and ducts, both exterior and interior.

4. Ductwork layouts, including locations of coils, dampers, filters, boxes and similar units.

5. Concealed control system devices and sensors.

C. Provide record drawings that illustrate the work of Division 23 as finally constructed. Deliver record drawings to the Architect in reproducible hard copy, Auto CAD or Revit format and PDF format on CD Rom, DVD, or Flash Drive. Also provide PDF format electronic copies of permit set with all revisions and RFI responses noted. Set shall include all architectural, structural, civil, mechanical, electrical, plumbing, and low voltage and all other vendors issued with the project. Provide PDF format of full specification set with all revisions and RFI responses noted. All PDF sets shall be bookmarked per phase, division and per drawing or specification section. A change log shall be provided listing each drawing and specification section and all drawing and specification issues including all addendums, clarifications, RFIs and change orders. Log shall indicate the most current version of each drawing and specification section.

D. Deliver record drawings to Architect within 30 days of Substantial Completion.

1.13 DEMONSTRATION

A. Provide factory trained personnel to instruct operating staff in maintenance and adjustment and operation of mechanical equipment. Provide instruction during regular work hours prior to acceptance and turn over to operating staff. Scheduling of training shall be at owner's direction. Use operating and maintenance manual and updated as-constructed drawings for instruction purposes.

B. Demonstrate normal start-up and shut-down, emergency shut-down and seasonal change over. Review operation of safety devices and control systems.

C. Inspections and Tests:

1. Arrange for all required inspections and tests.

2. Pay all charges.

3. Notify Architect / Engineer two (2) business days before tests.

4. Submit one copy for Owner's records of permits, licenses, inspection reports and test reports.

PART 2 PRODUCTS

2.1 SUBMITTALS

A. Bidders shall quote on brands and manufacturers of equipment as requested in these Specifications and Drawings. See appropriate section of the Contract Documents for requirements governing the prior approval process.

B. Coordinate submittals 3 weeks (min.) prior to expected order date so that work will not be delayed by submittals.

C. No extension of time will be allowed because of failure to properly coordinate and sequence submittals.

D. Submittals from subcontractors and equipment suppliers are to be carefully checked by the Contractor for space requirements and conformance to the Drawings and Specifications. These submittals shall be so noted by the Contractor prior to forwarding to the Architect/Engineer for checking. No deviations from the Drawings and Specifications will be allowed, recognized or considered unless brought to the attention of the Architect/Engineer at the time the submittals are submitted by the Contractor. Submittals not processed by the Contractor before forwarding to the Architect/Engineer for approval will be returned to the Contractor for his prior processing.

E. Submittal is for information and record, unless otherwise indicated, and is not a change order request.

F. Submitting Contractor is responsible for routing reviewed submittals to all parties affected including but not limited to electrical, structural, temperature control, and test and balance subcontractors.

G. Submittals shall include catalog cut-sheets with submitted products and options clearly identified, written descriptions, and specification sheets detailing the associated product, item and assembly.

H. No substitution for brands named in the Contract Documents will be considered unless written request has been submitted to the Engineer. Each such request shall include a complete description of the proposed substitute, drawings, cut sheets, performance and test data, and any other data or information necessary for complete evaluation. The burden of proving acceptability of a proposed product rests on the party submitting the

request for approval. Request for product approval substitutions shall be submitted in writing to the Engineer a minimum of ten (10) working days in advance of the bid date.

I. Shop drawings shall include details, installation drawings, assembly drawings, fabrication drawings, diagrams, and other information which show adaptation or installation of Contractor-furnished products or materials for overall project.

J. The purpose of submittals and shop drawings is to ensure Contractor understands design requirements and demonstrates understanding by indicating and detailing intended materials, methods, and installation practices. Submittals and shop drawings are not a method of requesting substitutions or deviation from Specifications. If discrepancies between submittals, shop drawings, and Contract Documents are discovered either prior to or after submittals and shop drawings are reviewed, requirements of Contract Documents shall take precedence.

K. Catalog numbers referenced throughout the Division 23 Drawings and Specifications are intended to convey a general understanding of the type and quality of the product required. Where written descriptions differ from information conveyed by a catalog number, the written description shall govern. No extra shall be allowed because a catalog number is found to be incomplete or obsolete.

L. Group complete information of related systems, products, and accessories in a single submittal. If submitted as a hard copy, submittals shall be submitted in a three-ring binder, with separate sections for each type or category of equipment, with labeled tabs indicating the contents of the section. If submitted electronically, the submittal shall be in a PDF file with each section bookmarked with labels. Within each section, each sub item or equipment tag shall be bookmarked with a corresponding tag.

M. In the front of each submittal binder, the Mechanical Contractor shall include a signed letter from the project Electrical Contractor indicating that the Electrical Contractor has reviewed the mechanical submittals and has verified that the equipment being submitted will conform to the design of the project electrical systems.

N. After Architect/Engineer review, submittals and shop drawings will be returned together with Submittal Review Sheet which indicates comments on submittals and shop drawings and with specific actions such as "No Exception Taken", "Make Corrections Noted", "Rejected", and "Resubmit". Continue to resubmit submittals and shop drawings until "No Exception Taken" or "Make Corrections Noted-Resubmittal Not Required" action is indicated.

O. Resubmittals will be reviewed for compliance with comment made on the original submittal only. Clearly identify replied-to comments with a resubmittal number and

date. If any other changes are made that are not in reply to comments, clearly identify the changes. Indicate dates of previous submissions and submittal numbers. Direct specific attention to any changes made in addition to those made in reply to previous review comments.

P. If more than two submittals (either for products, materials, shop drawings, record drawings, or test and balance reports) are made by the Contractor of basis of design, listed general equivalents or substitutions, the Owner reserves the right to charge the Contractor for subsequent reviews by their consultants at their consultants current published hourly rate. Such extra fees may be deducted from payments by the Owner to the Contractor.

Q. Refer to individual specification sections for submittal requirements. However, a minimum, shop drawings shall be submitted for each of the following items as applicable to the project:

1. Air Distribution Devices
2. Air Handling Units
3. Automatic Dampers
4. Controls & Control Diagrams including Wiring Plans
5. Duct Access Doors/Panels
6. Ductwork & Ductwork Construction
7. Electric Heaters
8. Fans
9. Flexible Ductwork
10. Gas Appliance Venting Flues and/or Fans
11. HVAC Pipe Accessories
12. Manual Dampers
13. Pipe & Duct Insulation & Accessories
14. Pipe Accessories
15. Pipe and Pipe Fittings

16. Pipe Hangers, Supports & Accessories
17. Pipe Identification Systems
18. Pressure Gauges
19. Pressure Reducing Valves
20. Relief Valves
21. Roof Curbs
22. Roof Mounted Air Intake/Relief Hoods
23. Thermometers
24. Air Terminal Units
25. Vibration Isolation Equipment

2.2 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," "Rectangular Duct Hangers Minimum Size," "Minimum Hanger Sizes for Round Duct."

D. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

E. Fasteners for all galvanized, stainless steel or aluminum supports shall be stainless steel.

F. All galvanized supports with coating damaged by drilling, cutting, welding or other means shall be coated with two coats of cold-galvanizing.

2.3 EQUIPMENT SUPPORTS

A. Structural steel for supports: ASTM A36.

B. Use galvanized members installed in fan plenums or areas of high humidity or condensation, and outside. All fasteners shall be stainless steel. Any damage caused by cutting, drilling, or welding or any other means to galvanized surface must be repaired by apply two coats of cold-galvanizing.

C. Furnish other members with shop coat of red primer.

D. Retouch primer after field welding.

E. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to properly support and anchor HVAC materials and equipment.

F. Comply with AWS D1.1 for field welding.

2.4 SLEEVES

A. Sleeve Material

1. Concrete floors, concrete and masonry walls: ASTM A 53, Type E, Grade B, schedule 40 black steel pipe.

2. Drywall partitions: 18 gauge galvanized steel sheet metal.

B. Sleeves shall be sized such that the annular space between outside surface of pipe or pipe insulation and the inside surface of the sleeve is not less than 1/2". Increase space as required to allow for uninterrupted insulation and free longitudinal movement. Provide larger annular space if required by firestopping product installation instructions.

C. Sleeves through floor assemblies shall extend 4" above the slab and provide a watertight seal .

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

2.5 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

B. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.6 ESCUTCHEONS

A. Split-casting, cast-brass type with chrome finish, with concealed hinge and set screw with an ID to closely fit around pipe, tube and insulation of insulated piping and an OD that completely covers opening.

2.7 WALL AND CEILING ACCESS PANELS

A. Style and type as required for material in which installed.

B. Size: 24"x24" minimum, as indicated, or as required to allow inspection, service and removal of items served.

C. 14 gauge minimum sheet metal for doors, 16 gauge frames of cadmium-plated or galvanized construction. Doors shall have expanded plaster rings where located in plaster walls or flanged finish where located in drywall or block construction.

D. For all doors installed outside, in ambient conditions, in wet areas, or in areas of high humidity , door shall be aluminum construction. Areas included, but not limited to, are outside air plenums, unconditioned penthouses, bathrooms, and kitchens. Door shall be a minimum of 1/8” thick aluminum with ¼” extruded aluminum frame with mitered and welded corners. Hinge shall be continuous stainless steel.

E. Panels shall have spring hinges with screwdriver locks in non-public areas. Key lock, keyed alike, for panels in public areas.

F. Prime painted or rust inhibitive paint finish.

G. UL labeled when in fire-rated construction, 1-1/2 hour rating.

H. Provide in walls, floors, and ceilings to permit access to all equipment and piping requiring service or adjustment. Examples of such equipment needing access are fire and/or smoke dampers, mechanical system valves, and equipment needing periodic or replacement maintenance.

I. Furnish and locate access panels under this Division. Coordinate with trades who are responsible for building system in which panels are to be installed.

J. Acceptable manufactures: Milcor, Nystrom, Karp, J.L. Industries, or Williams Brothers.

1. For masonry and drywall construction: Milcor Style M.

2. For plastered masonry walls and ceiling: Milcor Style K.

3. For ceramic tile or glazed structural tile: Use stainless steel panels.

4. For aluminum doors: Milcor Style CT, downward swing door.

PART 3 EXECUTION

3.1 INSTALLATION

A. Execute work such that all components function together as a complete, workable system. Make slight alterations necessary to make adjustable parts fit with fixed parts. Execute work to contribute to efficiency of operation, accessibility, sightliness, and minimum maintenance clearances. Leave equipment properly adjusted and in working order.

B. Verify dimensions indicated and report any error or inconsistency before commencing work.

C. Coordinate work with other trades through the General Contractor so that equipment, especially in the ceiling, will fit to patterns of finished materials, and locate all elements to carry harmony of architectural design throughout the building. Coordinate work with other trades to avoid conflicts, especially in places where close, careful fitting is required. Coordination problems and field solutions must be approved through the General Contractor and the Architect/Engineer before proceeding with work.

D. Conform and accommodate systems to the building structure, equipment and usage so that they do not interfere with the operation of any other system or operational part of the building.

E. Preparation: Final installation of materials and equipment shall be based on actual dimensions and conditions at the job site. Field measure for materials or equipment requiring exact fit.

F. Workmanship: Perform work in accordance with good commercial practice and all applicable trade standards, including current SMACNA standards. The finished appearance of the work shall be of equal importance with its mechanical efficiency.

G. Clearances: The Subcontractors working under this Division shall be responsible for the sufficiency of the size of shafts and chases, and clearances in double partitions and hung ceilings for proper equipment installation. Cooperate with Contractors of other Divisions whose work is in the same space and advise the General Contractor of requirements. Such spaces and clearances shall be kept to the minimum size required.

1. Install equipment, ductwork, piping and accessories:

    a. Straight and true.

    b. Aligned with other work and with general lines of the building.

    c. Concealed in occupied spaces, unless noted otherwise.

    d. Out-of-the-way with maximum passageway and headroom remaining in each space.

2. Except as otherwise indicated, arrange mechanical services and overhead equipment to not obstruct windows, doors or other openings. Clearance shall be a minimum of:

    a. 7'-6" headroom in mechanical spaces.

    b. 9'-6" headroom in unfinished or shell spaces.

3. Give the right-of-way to piping systems required to slope for drainage (over other service lines and ductwork).

H. Locate all equipment which must be serviced, operated or maintained in fully accessible positions. Equipment shall include, but not be limited to, valves, shock absorbers, traps, cleanouts, motors, controllers, switchgear, drain points, manual dampers, and smoke and fire dampers. If required for accessibility, the Contractor shall furnish access doors for this purpose, subject to the following:

1. Access door shall be sized to permit removal of equipment, or 24"x24" if used for service only.

2. Furnish doors to trades performing work in which they are to be installed. Group valves, devices and other equipment to permit use of minimum number of access doors.

3. Doors shall be lockable and suitable for painting to match adjacent finishes.

I. Minor deviations from the Drawings may be allowed to provide for better equipment accessibility. The General Contractor shall approve of any change prior to this Contractor making the change.

J. Properly locate anchors, chases, recesses and openings required for the proper installation of the work. Arrange with the proper contractors for the building of anchors, etc., and for the leaving of the required chases, recesses and openings in

sufficient time to be installed in the normal course of work. Install equipment and materials in accordance with manufacturer recommendations unless specifically indicated otherwise, or where local codes or regulations take precedence. This includes the performance of tests the manufacturer recommends. It is intended that anything, whether labor or materials, which is usually furnished as a part of any equipment specified and which is necessary for the best operation shall be furnished as a part of the contract without additional cost, whether or not shown or described.

K. Anchor and secure all equipment to the building substrate and structure. Provide all supplemental steel, anchors and attachments as required to properly support and anchor materials in this division.

L. Erect, install, and secure components in a structurally sound and appropriate manner.

M. Where necessary, temporarily brace, shore, or otherwise support members until final connections are installed.

N. Leave all temporary bracing, shoring, or other structural supports in place as long as practical for safety and to maintain proper alignment.

O. Handle materials in a manner to prevent scratching, abrading, distortion, chipping, breaking, or other disfigurement.

P. Conduct work in a manner to avoid injury or damage to previously placed work. Any work so impaired or damaged shall be replaced at no expense to Owner.

Q. Fabricate and install materials true to line, plumb, and level.

R. Leave finished surfaces smooth and flat, free from wrinkles, warps, scratches, dents, and other imperfections.

S. Testing: See individual Specification sections in Division 23 for testing of mechanical work.

T. Protection: Cover and seal ends of pipe and ductwork during construction to prevent entry of foreign material and moisture. Protect insulation against dirt, water, chemical or mechanical damage before, during and after installation. Protect fixtures and equipment against damage during mechanical work. All air handling equipment shall be fitted with all specified filters prior to any startup or operation. Provide additional sets of filters during construction as required to maintain cleanliness of system. Filter to be as scheduled or at a minimum high-quality, 30% min. efficient pleated filters. The use of "construction filters" is NOT authorized. Failure to provide required filters will

cause the contractor to provide, at their own cost, the services of an independent third party provider to clean and sterilize all contaminated duct systems.

U. Freeze Protection: Do not run piping in outside walls, or locations where freezing may occur. Piping next to outside walls shall be in furred spaces with insulation between the piping and the outside wall. Insulation of piping shall not be considered freeze protection. Water piping exposed to freezing conditions shall be insulated as specified, with aluminum weather jacket and electric heating cable, thermostatically controlled, as specified under 23 0533. Heat tracing shall be coordinated with Electrical Contractor and installed on all exterior water piping, per applicable Division 23 and 26 Specifications.

V. Scaffolding, Rigging and Hoisting: Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of any equipment and apparatus furnished; remove same from premises when no longer required.

W. Wherever possible, arrange for the movement and positioning of equipment so that enclosing partitions, walls and roofs will not be delayed or need to be removed. Otherwise, advise General Contractor of opening requirements to be maintained for the subsequent entry of equipment.

X. Coordinate the movement of heavy items with shoring and bracing so that the building structure will not be overloaded during the movement and installation.

Y. Where products to be installed on an existing roof are too heavy to be hand-carried, do not transport across the existing roof deck; position by crane or other device so as to avoid overloading the roof deck.

Z. Materials and apparatus required for the work to be new, of first-class quality, and to be furnished, delivered, installed, connected and finished in every detail. Equipment shall be selected and arranged such that it fits properly into the building space provided. Where no specific kind or quality of material is given, a first-class standard article shall be furnished.

AA. Equipment start-up and adjustment of all HVAC equipment and water heaters shall be performed by certified factory representatives of the respective equipment manufacturer.

BB. Furnish the services of an experienced superintendent, who will be constantly in charge of installation of the work, together with all skilled tradesmen, fitters, helpers and labor required to unload, transfer, erect, connect, adjust, start, operate and test each system.

3.2 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Hangers Exposed to View: Threaded rod and angle or channel supports. Coordinate with Architect for required painting of exposed supports.

3.3 THROUGH PENETRATIONS

A. References:

1. ASTM E 814: Standard Test Methods for Fire Tests of Through-Penetration Firestops.

2. UL 1479 Standard for Fire Tests of Through-Penetration Firestops, including optional air leakage test.

B. Non-Rated Walls

1. All penetrations through concrete or masonry walls shall be sleeved with a steel standard weight pipe sleeve which shall be grouted in place. Closures shall be provided between the pipe and sleeve wherever an exterior wall or is penetrated. Use Link-Seal modular rubber seals as manufactured by Thunderline Corp., Wayne, Michigan.

C. Fire Resistance Rated Assemblies

1. Performance Requirements

a. Penetrations: Provide through-penetration firestop systems that are installed to resist the spread of fire, passage of smoke and other hot gases according to requirements indicated, to restore the original fire-resistance rating of assembly penetrated.

1) Install complete through penetration firestop systems that have been tested and are listed by recognized testing agencies per ASTM E 814 or UL 1479 fire tests in a configuration that is representative of site conditions.

2) F-Rated Systems: Install through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814 or UL 1479, but not less than the fire resistance rating of the assembly being penetrated.

3) T-Rated Systems: Install through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814 or UL 1479, where required by the Building Code.

4) L-Rated Systems: Install through-penetration firestop systems with L-ratings as determined by UL 1479 and as required by the owner, architect or Authority Having Jurisdiction.

5) W-Rated Systems: Install through-penetration firestop systems meeting W-Rating Class 1 Requirements as determined by the UL Water Leakage Test for systems tested and listed in accordance with UL 1479 and as required by the owner, architect or Authority Having Jurisdiction.

6) For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

7) For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

2. Schedules

a. Unless otherwise noted on the drawings. Provide the fire stop systems or their approved equal as listed below:

1) Metallic Pipe, Metallic Ductwork, Non-Metallic Pipe smaller than 2".

2) a. 3M Fire Barrier Sealant CP 25WB+:

3) b. Material Description: Intumescent latex/water based caulk

4) c. Formulation: No-sag, non-halogen formula. Fast drying. Paintable

5) d. Water Resistance: Provide water resistant seal

6) Non-Metallic Pipe 2"-4"

7) a. 3M Fire Barrier FS-195+ Wrap/Strip with 3M Fire Barrier RC-1 Restricting Collar:

8) b. FS-195+ Material Description: One-part, organic/inorganic intumescent elastomeric strip with foil on one side.

3. Installation of Through-Penetration Firestop Systems

a. General

1) Install through-penetration firestop systems to comply with "Performance Requirements" above and firestop systems manufacturer's written installation instructions and published drawings for products and applications indicated.

2) Install forming/damming/backing materials and other accessories of types required to support fill material during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop system.

3) Install fill materials for firestop systems by proven techniques to produce the following results:

4) Fill voids and cavities formed by openings, forming materials, accessories and penetrating items as required to achieve the fire-resistance ratings indicated.

5) Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

b. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining surfaces.

c. Watertight. Meets UL Water Leakage Test - Class 1 requirements for systems tested and listed in accordance with the criteria of ASTM E 814 (UL 1479) Standard Test Method for Fire Tests of Through-Penetration Fire Stops. W Rating - Class 1 requirements include a minimum water column exposure of 3 ft. for 72 hours prior to the standard time / temperature curve for the fire test.

4. Field Quality Control

a. Proceed with enclosing through-penetration firestop systems with other construction only after inspection and approval by Authority Having Jurisdiction.

b. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.4 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.5 CLEANING

A. Cleaning During Construction and Final Cleaning: Comply with General Requirements.

B. Clean exposed surfaces of piping, hangers, ducts and other exposed items of grease, dirt or other foreign material. Clean and polish plumbing fixtures, fittings, and exposed plated piping. Leave clean and free from paint, grease, dirt, etc. Remove labels from exposed equipment. Carefully and thoroughly clean all items of equipment. If finishes have been damaged, refinish to original condition using factory-provided matching paint, and leave all equipment in proper working order and intended appearance. At the completion of the work, remove all rubbish, cleaning supplies and debris resulting from the operation and leave spaces clean and ready to use.

C. Replace air filters in all equipment immediately prior to Owner's Date of Acceptance. Clean ducts, blowers and coils if units were operated without filters at any time during construction. Provide one (1) complete set of clean filters to Owner at project turnover.

D. Flush all piping systems free of foreign substances before installing valves or making final connections. Notify the Owner/Architect seven (7) days in advance of final flushing so that Owner/Architect may attend and verify the cleanliness of the pipe.

3.6 MECHANICAL SERVICE AND MAINTENANCE

A. Include four (4) complete service and maintenance calls plus emergency calls spaced at reasonable intervals throughout one (1) year warranty period. During each maintenance call, technicians shall:

1. Verify proper working order of safety devices on each piece of equipment.
2. Check lubrication of all moving parts and lubricate as necessary.
3. Adjust V-belt drives for proper belt tension.
4. Verify proper operating temperatures, pressures, flows, etc. for each major piece of equipment.

END OF SECTION 230010

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General construction and requirements.

B. Applications.

C. Single phase electric motors.

D. Three phase electric motors.

E. General requirements for general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 RELATED REQUIREMENTS

A. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

B. Section 262913 - Enclosed Controllers.

1.3 REFERENCE STANDARDS

A. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; 2004.

B. IEEE 841 - IEEE Standard for Petroleum and Chemical Industry- Premium Efficiency, Severe-Duty, Totally Enclosed, Fan-Cooled (TEFC) Squirrel Cage Induction Motors UP to and Including 370 kW (500 HP), 2009.

C. NEMA MG 00001 - Motors and Generators; 2024.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture of electric motors for Commercial use, and their accessories, with minimum three years documented product development, testing, and manufacturing experience.

B. Comply with NFPA 70.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of high efficiency motors.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.6 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for motors larger than 20 horsepower.

1.7 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.

2. Torque, speed, and horsepower requirements of the load.

3. Ratings and characteristics of supply circuit and required control sequence.

4. Ambient and environmental conditions of installation location.

PART 2 PRODUCTS

2.1 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service:

1. Motors 3/4 HP and Smaller: 120 volts, single phase, 60 Hz.

2. Motors Larger than 3/4 Horsepower: 208 volts, three phase, 60 Hz.

B. Construction:

1. Open drip-proof type except where specifically noted otherwise.

2. Design for continuous operation in 104 degrees F environment.

3. Design for temperature rise in accordance with NEMA MG 00001 limits for insulation class, service factor, and motor enclosure type.

C. Explosion-Proof Motors: UL approved and labelled for hazard classification, with over temperature protection.

D. Severe-Duty Motors: Comply with IEEE 841.

E. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

F. Wiring Terminations:

1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.

2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.2 APPLICATIONS

A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not comply with these specifications.

B. Single phase, multi-speed motors: Variable torque, permanent split-capacitor type.

C. Single phase motors 1/20 HP and smaller: Shaded-pole type.

D. Single phase motors for shaft mounted fans, oil burners, and centrifugal pumps: Split phase type.

E. Single phase motors for shaft mounted fans or blowers: Permanent split capacitor type.

F. Single phase motors for fans, pumps, blowers, and air compressors: Capacitor start type.

G. Single phase motors for fans, blowers, and pumps: Capacitor start, capacitor run type.

H. Motors located in exterior locations, wet air streams downstream of sprayed coil dehumidifiers, draw through cooling towers, air cooled condensers, humidifiers, direct

drive axial fans, roll filters, explosion proof environments, and dust collection systems: Totally enclosed type.

I. Motors located in outdoors, in wet air streams downstream of sprayed coil dehumidifiers, in draw through cooling towers, and in humidifiers: Totally enclosed weatherproof epoxy-treated type.

J. Motors located outdoors and in draw through cooling towers: Totally enclosed weatherproof epoxy-sealed type.

K. Bearings: Preluricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

L. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device shall automatically reset when motor temperature returns to normal range.

2.3 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque.

B. Starting Current: Up to seven times full load current.

C. Breakdown Torque: Approximately 200 percent of full load torque.

D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.

E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.4 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque.

B. Starting Current: Up to six times full load current.

C. Multiple Speed: Through tapped windings.

D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.5 SINGLE PHASE POWER - CAPACITOR START MOTORS

A. Starting Torque: Three times full load torque.

B. Starting Current: Less than five times full load current.

C. Pull-up Torque: Up to 350 percent of full load torque.

D. Breakdown Torque: Approximately 250 percent of full load torque.

E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.

F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve bearings.

G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.6 THREE PHASE POWER - INDUCTION MOTORS

A. Starting Torque: Between 1 and 1-1/2 times full load torque.

B. Starting Current: Six times full load current.

C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.

D. Design, Construction, Testing, and Performance: Comply with NEMA MG 00001 for Design B motors.

E. Rotor: Random-wound, squirrel cage.

F. Service Factor: 1.15.

G. Multispeed Motors: Separate winding for each speed.

H. Insulation System: NEMA Class B or better.

I. Temperature Rise: Match insulation rating.

J. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.

K. Motor Frames: NEMA Standard T-Frames of cast iron for motor frame sizes 324T and larger and rolled steel for motor frame sizes smaller than 324T with end brackets of cast iron or aluminum with steel inserts.

L. Code Letter Designation:

1. Motors 15 HP and larger: NEMA starting Code F or Code G.

2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

M. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors embedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter; refer to Section 262913.

N. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

O. Sound Power Levels: To NEMA MG 00001.

P. Part Winding Start Where Indicated: Use part of winding to reduce locked rotor starting current to approximately 60 percent of full winding locked rotor current while providing approximately 50 percent of full winding locked rotor torque.

Q. Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.

R. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.

2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.

3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.

4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

S. Efficiency: Energy efficient as define in NEMA MG 1.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION 230513

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment components.

1.2 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.

2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.

3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.

a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Hanger Rods:

1. Threaded zinc-plated steel unless otherwise indicated.

2. Minimum Size, Unless Otherwise Indicated or Required:

   a. Equipment Supports: 1/2 inch diameter.

   b. Piping up to 1 inch: 1/4 inch diameter.

   c. Piping larger than 1 inch: 3/8 inch diameter.

   d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.

C. Pipe Supports:

1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2. Liquid Temperatures Up To 122 degrees F:

   a. Overhead Support: MSS SP-58 Types 1, 3 through 12.

   b. Support From Below: MSS SP-58 Types 35 through 38.

3. Operating Temperatures from 122 to 446 degrees F:

   a. Overhead Support: MSS SP-58 Type 1 or 3 through 12, with appropriate saddle of MSS SP-58 Type 40 for insulated pipe.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

E. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

END OF SECTION 230529

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 230548 - VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vibration-isolated equipment support bases.

B. Vibration isolators.

C. Vibration-isolated and/or seismically engineered roof curbs.

1.2 RELATED REQUIREMENTS

A. Section 014533 - Code-Required Special Inspections and Procedures.

B. Section 033000 - Cast-in-Place Concrete.

C. Section 230529 - Hangers and Supports for HVAC Piping and Equipment.

1.3 REFERENCE STANDARDS

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.

1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.

D. Shop Drawings - Vibration Isolation Systems:

1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.

2. Vibration-Isolated Equipment Support Bases: Include base weights, including concrete fill where applicable; indicate equipment mounting provisions.

E. Product Data:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolaion device and seismic-restraint component required.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-Evaluation Services (ICC-ES) or an agency acceptable to authorities having jurisdiction.

    b. Annotate to indicate application of each product submitted and compliance with requirements.

3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

F. Operation and Maintenance Data: For air-spring mounts and restrained air-spring mounts to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section, that is NRTL as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction. See Section 014533 - Code-Required Special Inspections and Procedures, for additional requirements.

C. Comply with the seismic-restraint requirements in the Interrnational Building Code (IBC) unless requirements in this section are more stringent.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M., "Structural Welding Code - Steel."

E. Seismic-restraint devices shall have horizontal and vertical load tersting and analysis and shall bear anchorage pre-approval by ICC-Evaluation Serivces (ICC-ES) or pre-approval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restaint ratings.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General:

1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.

2. Steel springs to function without undue stress or overloading.

2.2 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Concrete Inertia Bases:

1. Construction: Engineered, steel forms, with integrated isolator brackets and anchor bolts, welded or tied reinforcing bars running both ways in a single layer.

2. Size: 6 inches minimum depth and sized to accommodate elbow supports.

3. Mass: Minimum of 1.5 times weight of isolated equipment.

4. Connecting Point: Reinforced to connect isolators and snubbers to base including template and fastening devices for equipment.

5. Concrete: Filled on site with minimum 3000 psi concrete. See Section 033000 for additional requirements.

2.3 VIBRATION ISOLATORS

A. General Requirements:

1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.

B. Non-Seismic Type:

1. Elastomeric-Fiber Glass Pads:

a. Configuration: Flat or molded.

b. Thickness: 0.25 inch minimum.

c. Material: Oil and water resistant with elastomeric properties.

1) Infused non-woven cotton or synthetic fibers.

d. Assembly: Single or multiple layers using bonded, galvanized sheet metal separation plate between each layer with load bearing plate providing evenly distributed load over pad surface.

e. Surface: Waffle pattern.

2. Elastomeric Mounts:

a. Material: Molded oil, ozone, and oxidant resistant compounds of rubber, neoprene, or other elastomeric material.

b. Assembly: Encapsulated load transfer plate bolted to equipment and base plate with anchor hole bolted to supporting structure.

3. Steel Springs:

a. Assembly: Freestanding, laterally stable without housing.

b. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

c. Minimum Additional Travel: 50 percent of the required deflection at rated load.

d. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

e. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

f. Open Spring Isolator:

1) Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.

2) Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

3) Leveling Device: Rigidly connected to equipment or frame.

g. Two-part Telescoping Housing: Steel top and bottom frame separated by an elastomeric material and enclosing the spring.

1) Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.

2) Top hpusng with attachment and leveling bolt, threaded mounting holes and internal leveling device, or elastomeric pad.

4. Elastomeric Hangers:

    a. Housing: Steel construction containing elastomeric isolation element to prevent rod contact with housing and short-circuiting of isolating function.

    b. Incorporate steel load distribution plate sandwiching elastomeric element to housing.

5. Spring Hanger:

    a. Housing: Steel construction containing stable steel spring and integral elastomeric element preventing metal to metal contact.

    b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.

6. Combination Elastomeric-Spring Hanger:

    a. Housing: Steel construction containing stable steel spring with elastomeric element in series isolating upper connection of hanger box to building structure.

    b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:

1. Vibration-Isolated Equipment Support Bases:

    a. Provide specified minimum clearance beneath base.

2. Spring Isolators:

a. Position equipment at operating height; provide temporary blocking as required.

b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.

c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.

3. Isolator Hangers:

a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.

b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.

4. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.

5. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.

6. Adjust isolators to be free of isolation short circuits during normal operation.

7. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

END OF SECTION 230548

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Equipment Labels.

C. Warning Signs and Labels.

D. Pipe Labels.

E. Duct Labels.

F. Valve Tags.

G. Stencils.

H. Pipe markers.

1.2 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Identification painting.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Valve numbering scheme.

C. Valve Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Equipment Label Schedule: Include listing of all equipment to be labeled with the proposed content for each label.

E. Product Data: Provide manufacturers catalog literature for each product required.

F. Samples: Submit two labels ____ x ____ inch in size for color. letter style, and graphic representation required for each identification material and device.

G. Project Record Documents: Record actual locations of tagged valves.

H. Operation and Maintenance Manual: Include valve schedule in Operation and Maintenance Manual submission.

PART 2 PRODUCTS

2.1 EQUIPMENT LABELS AND NAMEPLATES

A. Manufacturers:

1. Brimar Industries, Inc; _____: www.pipemarker.com/#sle.

2. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.

3. Seton Identification Products, a Tricor Direct Company; _____: www.seton.com/#sle.

B. Letter Color: White.

C. Background Color: Black.

D. Labels:

1. Material and Thickness: Multi-layer plastic; 1/16 inch.

2. Maximum Temperature: Able to withstand temperatures up to 160 degrees F continuous.

3. Pre-drilled or stamped holes for attachment hardware.

4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 x 3/4 inch.

5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1 inch for viewing distances up to 72 inches and proprtionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the isze of principal lettering.

6. Fasteners: Stainless steel rivets or self-tapping screws.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers:

1. Brimar Industries, Inc.; _____: www.pipemarker.com.

2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.

3. Seton Identification Products; Model _____: www.seton.com.

B. Letter Color: Black.

C. Background Color: Safety-yellow.

D. Signs and Labels:

1. Material and Thickness: Multi-layer plastic; 1/16 inch.

2. Maximum Temperature: Able to withstand temperatures up to 160 degrees F continuous.

3. Pre-drilled or stamped holes for attachment hardware.

4. Minimum Label Size: Length and width vary for required label content, but not less than 3 x 5-1/4 inches.

5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches and proprtionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the isze of principal lettering.

6. Nomenclature: Large size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

7. Fasteners: Brass grommet and wire or Reinforced grommet and wire.

8. Content: Include caution and warning information plus emergency notification instructions.

2.3 DUCT LABELS

A. Manufacturers:

1. Brimar Industries, Inc.; _____: www.pipemarker.com.

2. Kolbi Pipe Marker Co.; Model _____: www.kolbipipemarkers.com.

3. Seton Identification Products; Model _____: www.seton.com.

B. Letter Color: White.

C. Background Color: Black.

D. Labels:

1. Material and Thickness: Multi-layer plastic; 1/16 inch.

2. Maximum Temperature: Able to withstand temperatures up to 160 degrees F continuous.

3. Pre-drilled or stamped holes for attachment hardware.

4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 x 3/4 inch.

5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1 inch for viewing distances up to 72 inches and proprtionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the isze of principal lettering.

6. Fasteners: Stainless steel rivets or self-tapping screws.

7. Content: Include identifiaction of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.

a. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

2.4 VALVE TAGS

A. Manufacturers:

1. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.

2. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.

3. Seton Identification Products, a Tricor Company; _____: www.seton.com/#sle.

B. Metal Tags: Brass with stamped or engraved letters; tag size minimum 1-1/2 inch diameter with smooth edges and pre-drilled or stamped holes for attachment hardware.

C. Number Height: 1/2 inch.

D. Letter Height for piping system abbreviation: 1/4 inch.

E. Fasteners: Brass S-hook.

F. Valve Tag Schedule: Typewritten letter size list in anodized aluminum frame for each piping system, on 8-1/2 x 11 inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification.

1. Mark valves for emergency shut-off and similar special uses.

2. Valve-tag schedule shall be included in operation and maintenance data.

2.5 STENCILS

A. Manufacturers:

1. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.

2. Kolbi Pipe Marker Co; _____: www.kolbipipemarkers.com/#sle.

3. Seton Identification Products, a Tricor Company; _____: www.seton.com/#sle.

B. Stencils: With clean cut symbols and letters of following size:

1. Clean cut symbols.

2. Stencil Material: Aluminum.

C. Pipe Lettering:

1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.

2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.

3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.

D. Ductwork and Equipment Lettering: 2-1/2 inch high letters.

E. Stencil Paint: As specified in Section 099123, exterior, gloss, alkyd enamel colors conforming to ASME A13.1.

2.6 PIPE LABELS

A. Manufacturers:

1. Craftmark Pipe Markers; _____: www.craftmarkid.com/#sle.

2. MIFAB, Inc.; _____: www.mifab.com/#sle.

3. Seton Identification Products, a Tricor Company; _____: www.seton.com/#sle.

B. Color: Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, pre-printed, color-coded, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

E. Flow Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.

F. Lettering Size:

1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.

2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.

3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond onf identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

B. Prepare surfaces in accordance with Section 099123 for stencil painting.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Apply stencil painting in accordance with Section 09 9123.

B. Locate pipe labels wheere piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short take-offs for terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum inteval of 50 feet along each run. reduce intevals to 25 feet in areas of congested piping and equipment.

7. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

3.4 DUCT LABEL INSTALLATION

A. Stenciled labels, showing service and flow direction, may be provided intead of plastic-laminated duct labels, at Installer's option, if lettering larger than 1-inch high is needed for proper identification because of distance.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or are concealed by a removable ceiling system.

3.5 VALVE TAG INSTALLATION

A. Install tags on valves andf control devices in piping systems, except check valves; valves within factory-fabricated equipment enclosures; shut-off valves; and HVAC termianl devices and similar roughing-in connnections of end-use units. List tagged valves in valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color, scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Shape:

a. Gas: Round.

2. Valve-Tag / Letter Color:

a. Gas: Black letters on safety-yellow background.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

3.7 INSTALLATION

A. Apply stencil painting in accordance with Section 099123.

B. Install plastic pipe markers in accordance with manufacturer's instructions.

C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

D. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

E. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 230553

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

1.2 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 110 - Methods of Testing Performance of Laboratory Fume Hoods; 2016.

C. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.

D. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, Eighth Edition.

E. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.

1. Include at least the following in the plan:

a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.

b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.

d. Final test report forms to be used.

e. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Revise TAB plan to reflect actual procedures and submit as part of final report.

2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.

3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.

4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.

5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:

1. AABC (NSTSB), AABC National Standards for Total System Balance.

2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.

3. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

2. Having minimum of three years documented experience.

3. Certified by one of the following:

a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.

b. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.2 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.3 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

3.4 SCOPE

A. Test, adjust, and balance the following:

1. Forced Air Furnaces.

2. Packaged Air Conditioning Units.

3. Air Handling Units.

4. Fans.

5. Air Inlets and Outlets.

3.5 MINIMUM DATA TO BE REPORTED

A. Electric Motors:

1. Manufacturer.

2. Model/Frame.

3. HP/BHP.

4. Phase, voltage, amperage; nameplate, actual, no load.

5. RPM.

6. Service factor.

B. V-Belt Drives:

1. Identification/location.

2. Required driven RPM.

3. Driven sheave, diameter and RPM.

4. Motor sheave diameter and RPM.

5. Center to center distance, maximum, minimum, and actual.

C. Electric Duct Heaters:

1. Manufacturer.
2. Identification/number.
3. Location.
4. Model number.
5. Design kW.
6. Number of stages.
7. Phase, voltage, amperage.
8. Air flow, specified and actual.
9. Temperature rise, specified and actual.

D. Air Moving Equipment:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.
7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.
9. Total static pressure (total external), specified and actual.
10. Inlet pressure.
11. Discharge pressure.
12. Fan RPM.

E. Return Air/Outside Air:

1. Identification/location.
2. Design air flow.
3. Actual air flow.
4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.
10. Actual mixed air temperature.

F. Exhaust Fans:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.

END OF SECTION 230593

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 230713 - DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

C. Jacketing and accessories.

1.2 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

E. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2014.

F. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2016.

G. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts; 2016.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

J. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

K. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

L. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, water-vapor permeance, list of materials and thickness for each service, and locations.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section .

C. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

D. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.

1. Duckwork Mockups;

a. One 10-foot section each of rectangular and round straight duct.

b. One each of a 90-degree mitered round and rectangular elbow, and one each of a 90-degree radius round and rectangular elbow.

c. One rectangular branch takeoff and one round branch takeoff from a rectangular duct. One round tee fitting.

d. One rectangular and round transition fitting.

e. Four support hangers for round and rectangular ductwork.

f. Eacht ype of damper and specialty.

2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.

3. Notify Architect seven days in advance of dates and times when mockups will be constructed.

4. Obtain Architect's approval of mockups before starting insulation application.

5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

7. Demolish and remove mockups when directed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness, ASTM standard designation, type and grade, and maximum use temperature.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 COORDINATION

A. Coordiante sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, UL 723, ASTM E84, or UL 723.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

2.2 GLASS FIBER, FLEXIBLE

A. Manufacturer:

1. Knauf Insulation; Friendy Feel Duct Wrap: www.knaufusa.com.

2. Johns Manville; Microlite: www.jm.com.

3. Owens Corning Corporation; SOFTR All-Service Duct Wrap: www.ocbuildingspec.com.

4. CertainTeed Corporation; SoftTouch Duct Wrap: www.certainteed.com.

B. Insulation: Mineral or glass fibers bonded with a thermosetting resin; ASTM C553, Type II and ASTM C 1290, Type III with factory-applied FSP jacket; flexible, noncombustible blanket.

1. 'K' value: 0.26 at 75 degrees F, when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 250 degrees F.
3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:

1. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
2. Secure with pressure-sensitive tape.
3. ASJ (All Service Jacket): White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
4. ASJ-SSL (Self-Sealing Lap):White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
5. FSK (Foil-Scrim-Kraft) Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
6. FSP (Foil-Scrim-Polyethylene) Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
7. Vynil Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

D. Vapor Barrier Tape:

1. Manufacturers:
   a. ABI, Ideal Tape Division; 491 AWF FSK.
   b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
   c. Compac Corporation; 110 and 111.
   d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
2. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film with pressure-sensitive rubber-based adhesive.

E. Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter.

2.3 GLASS FIBER, RIGID

A. Manufacturer:

1. Knauf Insulation; Insulation Board: www.knaufusa.com.
2. Johns Manville; 800 Series Spin-Glas: www.jm.com.
3. Owens Corning Corporation; 700 Series FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
4. CertainTeed Corporation; Commercial Board: www.certainteed.com.

B. Insulation: ASTM C612; rigid, noncombustible blanket.

1. Maximum Service Temperature: 450 degrees F.
2. Maximum Water Vapor Absorption: 5.0 percent.
3. Maximum Density: 8.0 pcf.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
3. Secure with pressure-sensitive tape.

D. Vapor Barrier Tape:

1. Manufacturers:
   a. ABI, Ideal Tape Division; 491 AWF FSK.
   b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
   c. Compac Corporation; 110 and 111.
   d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
2. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film with pressure-sensitive rubber-based adhesive.

2.4 FIRE-RATED INSULATION SYSTEM

A. Fire-Rated Board: Structural-grade, press-molded, xonolite calcium silicate, fireproofing board suitable for operating temperatures up to 1700 deg F. Comply with ASTM C 656, Type II, Grade 6. Tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

B. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

2.5 JACKETING AND ACCESSORIES

A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

1. Lagging Adhesive:

a. Manufacturers:

1) Childers Brand, Specialty Construction Brands, Inc., a business of H.B. Fuller Company; CP-AHV2.

2) Vimasco Corporation; 713 and 714.

b. Compatible with insulation.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; roll stock ready for shop or field cutting and forming. Thickness indicated in field=applied jacket schedules.

1. Adhesive: As recommended by jacket material manufacturer.

2. Color: White.

D. Aluminum Jacket: ASTM B209 (ASTM B209M); Alloy 3003, Temper H-14.

1. Joining: Longitudinal slip joints and 2 inch laps.

2. Fittings: 0.025 inch thick die shaped fitting covers with factory attached protective liner.

3. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

4. Moisture Barrier for Indoor Applications: 3-mil thick, heat-bonded polyethylene and kraft paper.

5. Moisture Barrier for Indoor Application: 3-mil thick, heat-bonded polyethylene and kraft paper.

E. Stainless-Steel Jacket: ASTM A 167 or ASTM A 240/A 240M; Type 304 or Type 316.

1. Joining: Longitudinal slip joints and 2 inch laps.

2. Fittings: 0.024 inch inch thick die shaped fitting covers with factory attached protective liner.

3. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

4. Moisture Barrier for Indoor Applications: 3-mil thick, heat-bonded polyethylene and kraft paper.

5. Moisture Barrier for Indoor Application: 3-mil thick, heat-bonded polyethylene and kraft paper.

2.6 DUCT LINER

A. Manufacturers:

1. Johns Manville; _____: www.jm.com/#sle.

2. Owens Corning Corporation; QuietR Rotary Duct Insulation ; _____: www.ocbuildingspec.com/#sle.

3. CertainTeed Corporation; _____: www.certainteed.com/#sle.

B. Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket and rigid board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.

1. Fungal Resistance: No growth when tested according to ASTM G21.

2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.

3. Service Temperature: Up to 250 degrees F.

4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.

5. Minimum Noise Reduction Coefficients:

a. 1 inch Thickness: 0.45.

C. Adhesive: Waterproof, fire-retardant type, ASTM C916.

D. Liner Fasteners: Galvanized steel, impact applied or welded with integral head.

PART 3 EXECUTION

3.1 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Insulated Ducts Conveying Air Below Ambient Temperature:

1. Provide insulation with vapor barrier jackets.

2. Finish with tape and vapor barrier jacket.

3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. Insulated Ducts Conveying Air Above Ambient Temperature:

1. Provide with or without standard vapor barrier jacket.

2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

E. External Duct Insulation Application:

1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.

2. Secure insulation without vapor barrier with staples, tape, or wires.

3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.

4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.

5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

F. Duct Liner Application:

1. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.

2. Seal and smooth joints. Seal and coat transverse joints.

3. Seal liner surface penetrations with adhesive.

4. Duct dimensions indicated are net inside dimensions required for air-flow. Increase duct size to allow for insulation thickness.

3.3 PENETRATIONS

A. Insulation Installation at Roof and Exterior Wall Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof or inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside flashing at least 2 inches below top of roof flashing or additionally overlap wall flashing at least 2 inches.

4. Seal jacket to flashing with flashing sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations.

Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

D. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket and Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.

2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.

3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.

b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

d. Do not overcompress insulation during installation.

e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.5 FIELD-APPLIED JACKET INSULATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.

2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.

3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.

2. Install lap or joint strips with same material as jacket.

3. Secure jacket to insulation with manufacturer's recommended adhesive.

4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch wide joint strips at end joints.

5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.6 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

3.7 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Test and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 INDOOR DUCT INSULATION SCHEDULE

A. Items Not Insulated:

1. Fibrous glass ducts.

2. Metal ducts with liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.

3. Factory insulated flexible ducts.

4. Factory insulated plenums and casings.

5. Flexible connectors.

6. Vibration control devices.

7. Factory insulated access doors and panels.

B. Concealed, Supply Air Duct and Plenum Insulation shall be the following:

1. Glass Fiber, Flexible: 2 inches thick and 1.0-lb/cu.ft. nominal density.

C. Concealed, Return Air Duct and Plenum Insulation shall be the following:

1. Glass Fiber, Flexible: 2 inches thick and 1.0-lb/cu.ft. nominal density.

D. Concealed, Outdoor Air Duct and Plenum Insulation shall be the following:

1. Glass Fiber, Flexible: 2 inches thick and 1.0-lb/cu.ft. nominal density.

E. Concealed, Exhaust Air Duct and Plenum Insulation between isolation damper and penetration of building exterior shall be the following:

1. Glass-Fiber, Flexible: 2 inches thick and 1.0-lb/cu.ft. nominal density.

F. Exposed (in equipment rooms, unfinished spaces, and unconditioned spaces), Supply Air Duct and Plenum Insulation shall be the following:

1. Glass Fiber, Rigid: 2 inches thick and 3.0-lb/cu.ft. nominal density.

G. Exposed (in equipment rooms, unfinished spaces, and unconditioned spaces), Return Air Duct and Plenum Insulation shall be the following:

1. Glass Fiber, Rigid: 2 inches thick and 3.0-lb/cu.ft. nominal density.

H. Exposed, Outdoor Air Duct and Plenum Insulation shall be the following:

1. Glass Fiber, Rigid: 2 inches thick and 3.0-lb/cu.ft. nominal density.

I. Exposed, Exhaust Air Duct and Plenum Insulation between isolation damper and penetration of building exterior shall be the following:

1. Glass Fiber, Rigid: 2 inches thick and 3.0-lb/cu.ft. nominal density.

J. Type I, Commercial Kitchen Hood Exhaust Duct and Plenum Insulation shall be the following:

1. Fire-rated, thickness as required to achieve 2-hour fire rating.

3.10 OUTDOOR DUCT INSULATION SCHEDULE

A. Exposed, Supply Air Duct Insulation shall be the following:

1. Glass Fiber, Rigid: 3 inches thick and 6.0-lb/cu.ft. nominal density.

B. Exposed, Return Air Duct Insulation shall be the following:

1. Glass Fiber, Rigid: 3 inches thick and 6.0-lb/cu.ft. nominal density.

C. Exposed, Outdoor Air Duct Insulation shall be the following:

1. Glass Fiber, Rigid: 3 inches thick and 6.0-lb/cu.ft. nominal density.

D. Exposed, Outdoor Air Duct Insulation shall be the following:

1. Glass Fiber, Rigid: 3 inches thick and 6.0-lb/cu.ft. nominal density.

3.11 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. PVC: 30 mils thick.

2. Aluminum, Stucco Embossed, 0.020 inch thick.

3. Stainless Steel, Type 304, Stucco Embossed, 0.016 inch thick.

D. Ducts and Plenums, Exposed:

1. PVC: 30 mils thick.

2. Aluminum, Stucco Embossed, 0.032 inch thick.

3. Stainless Steel, Type 304, Stucco Embossed, 0.024 inch thick.

3.12 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. PVC: 30 mils thick.

2. Aluminum, Stucco Embossed, 0.020 inch thick.

3. Stainless Steel, Type 304, Stucco Embossed, 0.016 inch thick.

D. Ducts and Plenums, Exposed, up to 48 inches in Diameter or with Flat Surfaces up to 72 inches::

1. Aluminum, Stucco Embossed, 0.032 inch thick.

2. Stainless Steel, Type 304, Stucco Embossed, 0.024 inch thick.

E. Ducts and Plenums, Exposed, Larger than 48 inches in Diameeter or with Flat Surfaces Larger than 72 inches:

1. Aluminum, Stucco Embossed, 0.032 inch thick.

2. Stainless Steel, Type 304, Stucco Embossed, 0.024 inch thick.

END OF SECTION 230713

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 230719 - HVAC PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jacketing and accessories.

1.2 REFERENCE STANDARDS

A. ASTM A240 / A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Perssure Vessels and for General Applications; 2015.

B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

E. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

F. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).

G. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2013).

H. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging; 2014.

I. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2016.

J. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2017.

K. ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing; 2010 (Reapproved 2016).

L. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation; 2017.

M. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

N. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation; 2012.

O. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012.

P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

Q. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.5 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, UL 723, ASTM E84, or UL 723.

2.2 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:

1. Aeroflex USA, Inc; Aerocel: www.aeroflexusa.com.
2. Armacell LLC; AP Armaflex: www.armacell.us.
3. K-Flex USA LLC; Insul-Lock, Insul-Tube, and K-FLEX LS: www.kflexusa.com.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 180 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

1. Manufacturers:
   a. Aeroflex USA, Inc.; Aeroseal.
   b. Armacell LLC; Armaflex 520 Adhesive.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
   d. K-Flex USA; R-373 Contact Adhesive

2.3 JACKETING AND ACCESSORIES

A. PVC Plastic.

1. Manufacturers:
   a. Johns Manville Corporation; Zeston: www.jm.com.
   b. P.I.C. Plastics, Inc.; FG Series.
   c. Proto Corporation; LoSmoke.
   d. Speedline Corporation; SmokeSafe.
2. Jacket: One piece molded type fitting covers and sheet material, white color.

3. Covering Adhesive Mastic: Compatible with insulation, as recommended by jacket material manufacturer.

a. Manufacturers:

1) Dow Corning Corporation; 739, Dow Silicone.

2) Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive

3) P.I.C. Plastics, Inc.; Welding Adhesive.

4) Speedline Corporation; Polyco VP Adhesive.

B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.

1. Thickness: 0.016 inch sheet.

2. Finish: Embossed.

3. Joining: Longitudinal slip joints and 2 inch laps.

4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated Pipes Conveying Fluids Below Ambient Temperature:

1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

E. Inserts and Shields:

1. Application: Piping 1-1/2 inches diameter or larger.

2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

3. Insert location: Between support shield and piping and under the finish jacket.

4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

F. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.

G. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

H. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

3.3 INDOOR PIPING INSULATION SCHEDULE:

A. Cooling Systems:

1. Condensate and Equipment Drain Water below 60 deg F:

a. NPS 1-1/4 and Smaller: Insulation shall be the following:

1) Flexible Elastomeric: 1/2 inch thick.

b. NPS 1-1/2 and Larger: Insulation shall be the following:

1) Flexible Elastomeric: 1 inch thick.

2. Refrigerant Suction:

a. All pipe sizes: Insulation shall be the following:

1) Flexible Elastomeric: 1 inch thick.

3. Refrigerant Hot Gas:

a. All pipe sizes: Insulation shall be the following:

1) Flexible Elastomeric: 1 inch thick.

END OF SECTION 230719

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 230913 - INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Control panels.

B. Damper Operators:

1. Electric operators.

C. Input/Output Sensors:

1. Temperature sensors.

2. Static pressure (air pressure) sensors.

3. Equipment operation (current) sensors.

4. Damper position indicators.

D. Thermostats:

1. Electric room thermostats.

2. Line voltage thermostats.

E. Time clocks.

F. Damper operators.

G. Time clocks.

1.2 SUBMITTALS

A. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

B. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

PART 2 PRODUCTS

2.1 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.2 CONTROL PANELS

A. Unitized manufacturer provided, equipment mounted type for each system with relays and controls and temperature indicators, pressure gauges, pilot lights, push buttons and switches.

2.3 DAMPER OPERATORS

A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.

1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.

B. Electric Operators:

1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

2.4 INPUT/OUTPUT SENSORS

A. Temperature Sensors:

1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.

2. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F.

3. 100 ohm platinum RTD is acceptable if used with project DDC controllers.

4. Temperature Sensing Device: Compatible with project DDC controllers.

5. Performance Characteristics:

2.5 THERMOSTATS

A. Electric Room Thermostats:

1. Type: NEMA BS 31032, 24 volts, with setback/setup temperature control.

2. Covers: Locking with set point adjustment, with thermometer.

B. Line Voltage Thermostats:

1. Dead Band: Maximum 2 degrees F.

2. Cover: Locking with set point adjustment, with thermometer.

3. Rating: Motor load.

2.6 TIME CLOCKS

A. Seven day programming switch timer with synchronous timing motor and seven day dial, continuously charged Ni-cad battery driven power failure 8 hour carry over and multiple switch trippers to control systems for minimum of two and maximum of eight signals per day with two normally open and two normally closed output switches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

B. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide mixing dampers of opposed blade construction arranged to mix streams. Provide pilot positioners on mixed air damper motors.

C. Provide isolation (two position) dampers of parallel blade construction.

D. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.

E. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in

same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

F. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.

G. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

END OF SECTION 230913

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 232300 - REFRIGERANT PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Valves.

E. Strainers.

F. Filter-driers.

G. Flexible connections.

H. Exterior penetration accessories.

1.2 REFERENCE STANDARDS

A. AHRI 710 - Performance Rating of Liquid-Line Driers; 2009.

B. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2013.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

D. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2013.

E. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2016.

F. ASME B31.9 - Building Services Piping; 2014.

G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

H. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2016.

I. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011-AMD 1.

J. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

1.3 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with {\rs\#1} unless indicated otherwise.

C. Liquid Indicators:

1. Use line size liquid indicators in main liquid line leaving condenser.

2. If receiver is provided, install in liquid line leaving receiver.

3. Use line size on leaving side of liquid solenoid valves.

D. Valves:

1. Use service valves on suction and discharge of compressors.

2. Use gauge taps at compressor inlet and outlet.

3. Use gauge taps at hot gas bypass regulators, inlet and outlet.

E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

F. Strainers:

1. Use line size strainer upstream of each automatic valve.

2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.

3. Use shut-off valve on each side of strainer.

G. Filter-Driers:

1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

H. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

1.5 QUALITY ASSURANCE

A. Designer Qualifications: Design piping system under direct supervision of a Professional Engineer experienced in design of this type of work.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Comply with ASME B31.9 for installation of piping system.

2.2 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.

1. Fittings: ASME B16.22 wrought copper.

2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

B. Copper Tube to 7/8 inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.

C. Pipe Supports and Anchors:

1. Provide hangers and supports that comply with MSS SP-58.

a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

5. Vertical Support: Steel riser clamp.

6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

7. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

8. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

9. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:

   a. Bases: High density, UV tolerant, polypropylene or reinforced PVC.

   b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.

   c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

   d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.

   e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.

2.3 REFRIGERANT

A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

B. Refrigerant: R-134a, tetrafluoroethane as defined in ASHRAE Std 34.

2.4 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.5 VALVES

A. Manufacturers:

1. Hansen Technologies Corporation; _____: www.hantech.com/#sle.
2. Henry Technologies; _____: www.henrytech.com/#sle.
3. Flomatic Valves; _____: www.flomatic.com/#sle.

B. Diaphragm Packless Valves:

1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

C. Packed Angle Valves:

1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, solder or flared ends; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

D. Ball Valves:

1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.

E. Service Valves:

1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

2.6 STRAINERS

A. Manufacturers:

1. Hansen Technologies Corporation; _____: www.hantech.com/#sle.
2. Parker Hannifin/Refrigeration and Air Conditioning; _____: www.parker.com/#sle.
3. Sporlan, a Division of Parker Hannifin; _____: www.parker.com/#sle.

B. Straight Line or Angle Line Type:

1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

2.7 FILTER-DRIERS

A. Manufacturers:

1. Flow Controls Division of Emerson Electric; _____: www.emersonflowcontrols.com/#sle.

2. Parker Hannifin/Refrigeration and Air Conditioning; _____: www.parker.com/#sle.

3. Sporlan, a Division of Parker Hannifin; _____: www.parker.com/#sle.

B. Performance:

1. Flow Capacity - Liquid Line: As indicated in schedule, minimum, rated in accordance with AHRI 710.

2. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.

3. Design Working Pressure: 350 psi, minimum.

C. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

D. Construction: UL listed.

1. Connections: As specified for applicable pipe type.

2.8 FLEXIBLE CONNECTORS

A. Manufacturers:

1. Circuit Hydraulics, Ltd; _____: www.circuit-hydraulics.co.uk/#sle.

2. Flexicraft Industries; _____: www.flexicraft.com/#sle.

3. Penflex; _____: www.penflex.com/#sle.

B. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure of 500 psi.

2.9 EXTERIOR PENETRATION ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

E. Inserts:

1. Provide inserts for placement in concrete formwork.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

F. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.5.

2. Support horizontal piping as indicated.

3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

4. Place hangers within 12 inches of each horizontal elbow.

5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Test refrigeration system in accordance with ASME B31.5.

C. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using halide torch. Test to no leakage.

3.4 SCHEDULES

A. Hanger Spacing for Copper Tubing.

1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.

2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.

3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.

4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.

5. 2-1/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.

END OF SECTION 232300

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 233100 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flexible ducts.

B. Nonmetal ducts.

C. Ducts for laboratory and industrial-grade applications.

D. Metal ductwork.

E. Flexible duct.

1.2 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

E. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.

F. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.

G. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.

H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

I. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.

J. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

K. SMACNA (PVC) - Thermoplastic Duct (PVC) Construction Manual; 1995.

L. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for duct materials.

C. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.

1.5 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 DUCT ASSEMBLIES

A. Regulatory Requirements: Construct ductwork to comply with {\rs\#1} standards.

B. Ducts: Galvanized steel, unless otherwise indicated.

C. Low Pressure Supply (Heating Systems): 2 inch w.g. pressure class, galvanized steel.

D. Low Pressure Supply (System with Cooling Coils): 2 inch w.g. pressure class, galvanized steel.

E. Return and Relief: 2" inch w.g. pressure class, galvanized steel.

F. General Exhaust: 2" inch w.g. pressure class, galvanized steel.

G. Outside Air Intake: 2" inch w.g. pressure class, .

H. Transfer Air and Sound Boots: 1/2 inch wg pressure class, fibrous glass.

2.2 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.

2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

3. For Use with Flexible Ducts: UL labeled.

4. Manufacturers:

a. Carlisle HVAC Products; Hardcast Versa-Grip 181 Water Based Fiber Reinforced Duct Sealant: www.carlislehvac.com/#sle.

C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.

2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.

3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.

4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.

5. Other Types: As required.

2.3 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

2.4 MANUFACTURED DUCTWORK AND FITTINGS

A. Fiber Glass Reinforced Plastic (FRP) Ducts: Glass fiber reinforced plastic, minimum 3/16 inch wall thickness.

B. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).

2.5 FLEXIBLE DUCTS

A. Flexible Air Ducts:

1. UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound spring steel wire.

2. Pressure Rating: From 10 in-wc positive to 1 in-wc negative.

3. Maximum Velocity: 4,000 fpm.

4. Temperature Range: Minus 20 to 210 degrees F.

2.6 NON-METAL DUCTS

A. Thermoset Fiber Glass Reinforced Plastic (FRP) Ducts:

1. Glass fiber reinforced plastic with minimum wall thickness of 3/16 inch.

2.7 DUCTS FOR LABORATORY AND INDUSTRIAL-GRADE APPLICATIONS

A. Duct Class:

1. Class 5: Corrosive fumes in light concentrations at a minimum conveying velocity of 1,000 to 2,000 fpm.

B. Sectional Shape and Material Requirements:

1. Round Thermoplastic (PVC I) Duct: exhaust air from Chlorine and Chemical room.

a. Class 5 Air Duct Capacity:

1) Pressure Class: Minus 2 in-wc.

2) Pressure: Plus or minus 10 in-wc.

3) Maximum Temperature: 100 degrees F.

b. Protection: Apply ultraviolet protection for segments exposed to direct sunlight.

c. Compliance: Provide reinforced ductwork, fittings, supports, hangers, and appurtenances in compliance with SMACNA (PVC).

2. Rectangular Thermoset (FRP) Duct: supply air for Chlorine and Chemical room.

a. Protection: Apply weather resistant and ultraviolet protection coatings for segments exposed to direct sunlight.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install in accordance with manufacturer's instructions.

C. During construction provide temporary closures of metal or duct opening closure film on open ductwork to prevent construction dust from entering ductwork system. Ends of duct shall be sealed at the end of each day. Duct and fittings shall be delivered to job site with ends covered.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

E. All longitudinal and transverse joints, seams and duct sidewall penetrations, regardless of pressure classification, shall be sealed with duct sealer. Follow SMACNA Table 1-2, Seal Class A for all supply, return and exhaust ductwork.

F. Duct sealant shall be applied per manufacturer's instructions. Minimum drying time shall be allowed per manufacturer's instructions. Additional time for drying shall be allowed in climates where temperature or humidity may affect the curing of the sealant. Sealant shall be allowed to completely dry and harden before air is circulated through the ductwork.

G. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

I. Use double nuts and lock washers on threaded rod supports.

J. At exterior wall fan, seal duct to fan frame .

END OF SECTION 233100

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers - metal.

C. Fiberglass backdraft dampers.

D. Flexible duct connectors.

E. Volume control dampers.

F. Fiberglass control dampers.

G. Miscellaneous products:

1. Damper operators.

2. Duct opening closure film.

1.2 RELATED REQUIREMENTS

A. Section 233100 - HVAC Ducts and Casings.

B. Section 253513 - Integrated Automation Actuators and Operators: Damper operators.

1.3 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

C. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.

D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Project Record Drawings: Record actual locations of access doors.

PART 2 PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers:

1. Carlisle HVAC Products: www.carlislehvac.com.

2. Elgen Manufacturing: www.elgenmfg.com.

3. Krueger: www.krueger-hvac.com.

4. Ruskin Company: www.ruskin.com.

5. Titus: www.titus-hvac.com.

6. Ward Industries: www.wardind.com/#sle.

B. Multi-blade device with airfoil blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps. Similar to Carlisle Dynair Hollow Vane and Rail (Double Wall Vane)

2.2 BACKDRAFT DAMPERS - METAL

A. Manufacturers:

1. Greenheck; : www.greenheck.com

2. Louvers & Dampers, Inc: www.louvers-dampers.com.

3. Nailor Industries Inc: www.nailor.com.

4. Ruskin Company: www.ruskin.com.

B. Gravity Backdraft Dampers, Size 18 by 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

C. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.3 FIBERGLASS BACKDRAFT DAMPERS

A. Fiberglass Material Construction: ASTM E84, flame retardant, vinyl ester based resin.

B. Counterbalanced assembly, 18 inches round, flanged. Fiberglass-made frame with single butterfly blade. Steel-fabricated axle with graphite-filled PTFE sleeve bearings located out of the airstream, and metal paint finish.

C. Counterbalanced assembly, 18 by 18 inches in size, flanged. Fiberglass-made frame with multiple v-groove shape blades. Stainless-steel axle with molder PTFE bearings located out of the airstream, elastomeric blade seals, and standard exterior coating.

D. Maximum Operating Pressure: 10 in-wc.

E. Maximum Temperature Service: 200 degrees F.

2.4 FLEXIBLE DUCT CONNECTORS

A. Manufacturers:

1. Carlisle HVAC Products: www.carlislehvac.com.

2. Elgen Manufacturing: www.elgenmfg.com.

3. Ventfabrics :www.ventfabrics.com/

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Flexible Duct Connections: Fabric crimped into metal edging strip.

1. Inside applications other than corrosive environments, fume hood exhaust, or kitchen exhaust.

a. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric compliant with NFPA 90A, minimum density 30 oz per sq yd. Net Fabric Width: Approximately 3 inches wide. Similar to Ventfabric Ventglas.

b. Metal: 3 inches wide, 24 gauge, 0.0239 inch thick galvanized steel.

c. Suitable for temperatures between -20° F and 200° F.

d. Suitable for +/- 10" w.g. static pressure while being airtight and waterproof.

2. Outside applications other than corrosive environments, fume hood exhaust, or kitchen exhaust.

a. Fabric: UL listed fire-retardant woven glass fabric double coated with Hypalon compliant with NFPA 90A, minimum density 26 oz per sq yd. Net

Fabric Width: Approximately 3 inches wide. Similar to Ventfabric Ventlon.

b. Metal: 3 inches wide, 24 gage, 0.0239 inch thick galvanized steel.

c. Suitable for temperatures between -10° F and 200° F.

d. Suitable for +/- 10" w.g. static pressure while being airtight and waterproof.

3. Indoor or outdoor application for corrosive environments or fume hoods.

a. Fabric: UL listed fire-retardant woven glass fabric coated with Teflon compliant with NFPA 90A, minimum density 14 oz per sq yd. Net Fabric Width: Approximately 3 inches wide. Similar to Ventfabric Ventlel.

b. Metal: 3 inches wide, 24 gage, 0.0239 inch thick galvanized steel.

c. Suitable for temperatures between -20° F and 200° F.

d. Suitable for +/- 10" w.g. static pressure while being airtight and waterproof.

D. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

E. Maximum Installed Length: 14 inch.

2.5 VOLUME CONTROL DAMPERS

A. Manufacturers:

1. Greenheck; : www.greenheck.com

2. Louvers & Dampers, Inc: www.louvers-dampers.com.

3. Nailor Industries Inc: www.nailor.com.

4. Ruskin Company: www.ruskin.com.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Single Blade Dampers:

1. Blade: 24 gage, 0.0239 inch, minimum.

2. Shaft: 1/2" square rod operator with end bearings and gasket seal at duct penetrations. Terminate shaft in damper frame with bushings.

D. Multi-Blade Damper: Fabricate of 3V style opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

1. Blade: 18 gauge, 0.0478 inch, minimum.

2. Shaft: 1/2" square rod operator with end bearings and gasket seal at duct penetrations. Terminate shaft in damper frame with bushings.

E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

1. Manufacturers:

a. Carlisle HVAC Products; Dynair End Bearing Leak Resistant Sets: www.carlislehvac.com/#sle.

b. Elgen Manufacturing Company, Inc; ____: www.elgenmfg.com/#sle.

F. Quadrants:

1. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Minimum 12 gauge construction.

2. On externally insulated ducts, mount quadrant regulators on stand-off mounting brackets, bases, or adapters with height equivalent to insulation thickness.

3. Where rod lengths exceed 30 inches provide regulator at both ends.

2.6 FIBERGLASS CONTROL DAMPERS

A. Fiberglass Material Construction: ASTM E84, flame retardant, vinyl ester based resin.

B. Round: Fiberglass frame, blade, and axle assembly with molded PTFE bearings, flanged, and control shaft extended 6 inch beyond frame. Finished with standard exterior coating.

C. Rectangular: Fiberglass frame, airfoil-shaped opposed blades and axle assembly with molded PTFE bearings, flanged and stainless steel control linkage out of the airstream. Finished with standard exterior coating.

D. Maximum Operating Pressure: 10 in-wc.

E. Maximum Temperature Service: 200 degrees F.

F. Construction:

1. Fiberglass Material: Flame retardent, Series 625 vinyl ester based resin.

2.7 MISCELLANEOUS PRODUCTS

A. Damper Operators: Provide electric operators;

B. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.

1. Thickness: 2 mils.

2. High tack water based adhesive.

3. UV stable light blue color.

4. Elongation Before Break: 325 percent, minimum.

5. Manufacturers:

a. Carlisle HVAC Products; Dynair Duct Protection Film: www.carlislehvac.com/#sle.

b. Elgin; Shrink Wrap with PSA: www.elgenmfg.com

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 233100 for duct construction and pressure class.

B. Install duct opening closure film on open ductwork at end of day. All ductwork delivered to site shall have ends covered with closure film.

C. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. Provide insulated duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers,

duct mounted airflow measuring stations and elsewhere as indicated. Provide access door at smoke detectors and humidifiers. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Review locations prior to fabrication.

E. Check duct connections at access doors for air leakage or condensation. Correct conditions found.

F. Attach multiple damper section assemblies together in accordance with manufacturer's instructions. Install support mullions as reinforcement between assemblies as required. Provide and install bracing for multiple section assemblies to support assembly weight and to hold against system pressure.

G. At fans and motorized equipment associated with ducts, except kitchen grease exhuast fans, provide flexible duct connections immediately adjacent to the equipment.

END OF SECTION 233300

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 233416 - FIBERGLASS REINFORCED PLASTIC CENTRIFUGAL EXHAUST FANS

PART I GENERAL

1.1 WORK INCLUDED

A. FRP Centrifugal Exhaust.

1.2 RELATED WORK

A. All sections, drawing plans, specifications and contract documents.

1.3 REFERENCES

A. AMCA -99 Standards Handbook

B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.

C. AMCA 211 - Certified Ratings Procedure - Air Performance.

D. AMCA 300 - Test Code for Sound Rating Air Moving Devices.

E. AMCA 311 - Certified Sound Ratings Program for Air Moving Devices.

F. AMCA 204 - Balance Quality and Vibration Levels for Fans.

G. ANSI/AIHA Z9.5-2003, “Laboratory Ventilation”

H. ASHRAE, “Laboratory Design Guide”

1.4 QUALITY ASSURANCE

A. Performance Ratings: Tested in accordance to AMCA 211 and AMCA 311.

B. Units specified as Spark Resistant Construction shall conform to AMCA 99-0401-86, “Classifications for Spark Resistant Construction”.

C. Each fan shall be tested before shipping. Motors to be tested for amperage drawn.

D. Fans shall be statically and dynamically balanced.

1.5 SUBMITTALS

A. Product Data:

B. Include rated capacities, furnished specialties, and accessories for each fan.

C. Certified fan performance curves with system operating conditions indicated.

D. Certified fan sound-power ratings.

E. Motor ratings and electrical characteristics, plus motor and electrical accessories.

F. Material thickness and finishes, including color charts.

G. Dampers, including housings, linkages, and operators.

PART 2 PRODUCTS

2.1 GENERAL

2.2 REFERENCE STANDARDS

A. AMCA 99 - Standards Handbook; 2016.

B. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.

C. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.

D. AMCA 211 - Certified Ratings Program Product Rating Manual for Fan Air Performance; 13th Edition, Revised 2017.

E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

F. AMCA 311 - Certified Ratings Program Product Rating Manual for Fan Sound Performance; 2016.

G. Base fan performance shall follow AMCA standard conditions at 0 ft elevation and 70 Deg F. (Air Density shall be 0.075 Lb/ft3)

H. Fans selected shall be capable of accommodating static pressure and airflow of scheduled values.

I. All fan assembly hardware to be 304 stainless steel

J. Fan shall be direct drive AMCA Arrangement 4.

2.3 ACCEPTABLE MANUFACTURERS

A. FanAm, Inc.; www.fanam.com

B. IPF Colasit; www.ipfcolasit.com

C. VPC Fiberglass; www.vpcfiberglass.com

2.4 FAN HOUSING

A. Fan housing shall be manufactured in Fiberglass Reinforced Plastic (FRP) for maximum corrosion resistance, and structural strength. Fastening bolts holding the casing to the support plate are to be encapsulated in FRP and not exposed to the airstream. Inside of housing shall be gel coated for maximum corrosion resistance.

B. Fan housing needs to be able to withstand temperatures up to 212 Degrees Fahrenheit.

C. Fan housing to be aerodynamically designed with high-efficiency inlet venturi in order to maximize performance.

D. When specified, provide a casing drain attached to the casing at the lowest point for condensation removal.

E. Fan inlet and outlet to be slip connection.

F. Standard finish color to be light gray.

G. Housing shall be field rotatable in 45 degree steps and provide 8 various discharges.

H. Units specified as Spark Resistant Construction shall be constructed to the AMCA Spark Resistant Construction level as dictated on plans and specifications.

2.5 BACKWARD CURVED AIRFOILED FAN IMPELLER

A. Fan Impeller should be of a Backward Curved Airfoil (BCA) design and have non-overloading characteristics.

B. Fan Impeller shall be injection molded from high strength glass reinforced polyamide.

C. Fan Impeller shall have a browning bushing fastening system that allows for easy impeller service and replacement.

D. Fan Impellers constructed from steel and coated with a plastic material are not acceptable.

E. The impeller shall be electronically balanced both statically and dynamically in accordance with AMCA Standard 204-96, “Balance Quality and Vibration Levels for Fans”..

2.6 BASE SUPPORT

A. Fan base support to be manufactured in formed steel and to be polyester coated.

B. Fan base support shall be able to support vibration isolators.

C. If selected, a polypropylene weather cover to be provided with motor ventilation at the bottom.

2.7 FAN MOTORS AND DRIVES

A. Fan motors shall be Explosion Proof (EXP), NEMA frame, nominal 1140, 1725 or 3400 RPM with a 1.15 service factor.

B. Shafts to be AISI -1045 carbon steel. The shaft shall not be in the corrosive air stream.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install centrifugal fans level and plumb.

B. Lift and support units with manufacturer's designated lifting or supporting points.

C. Equipment Mounting:

1. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

2. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

D. Install units with clearances for service and maintenance.

E. Label fans according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to fans to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Verify that shipping, blocking, and bracing are removed.

D. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.

1. Verify that cleaning and adjusting are complete.

2. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.

3. Verify lubrication for bearings and other moving parts.

4. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.

5. See Section 230593 "Testing, Adjusting, and Balancing For HVAC" for testing, adjusting, and balancing procedures.

6. Remove and replace malfunctioning units and retest as specified above.

E. Test and adjust controls and safeties. Controls and equipment will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain centrifugal fans.

END OF SECTION 233416

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 233423 - HVAC POWER VENTILATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof ventilators.

B. Wall exhausters.

C. Cabinet exhaust fans.

D. Ceiling exhaust fans.

E. Inline centrifugal fans and blowers.

1.2 REFERENCE STANDARDS

A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

B. AMCA 99 - Standards Handbook; 2016.

C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.

D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.

E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.

2. Extra Fan Belts: One set for each individual fan.

PART 2 PRODUCTS

2.1 POWER VENTILATORS - GENERAL

A. Manufacturers:

1. Carnes, a division of Carnes Company Inc; _____: www.carnes.com/#sle.

2. Greenheck Fan Corporation; _____: www.greenheck.com/#sle.

B. Static and Dynamically Balanced: Comply with AMCA 204.

C. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.

D. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.

E. Fabrication: Comply with AMCA 99.

F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.2 WALL EXHAUSTERS

A. Manufacturers:

1. Carnes, a division of Carnes Company Inc; _____: www.carnes.com/#sle.

2. Greenheck Fan Corporation; _____: www.greenheck.com/#sle.

3. Patterson Fan Company, Inc; _____: www.pattersonfan.com/#sle.

B. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh, 0.062 inch thick aluminum wire bird screen.

C. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

D. Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required

rpm can be reached with sheaves set at mid-position; fan shaft with self-aligning prelubricated ball bearings.

E. Performance Ratings: As indicated on drawings.

2.3 CABINET EXHAUST FANS

A. Manufacturers:

1. Carnes, a division of Carnes Company Inc; _____: www.carnes.com/#sle.

2. Greenheck Fan Corporation; _____: www.greenheck.com/#sle.

3. Twin City Fan & Blower; T: www.tcf.com/#sle.

B. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resiliently mounted motor, gravity backdraft damper in discharge.

C. Grille: Molded white plastic.

D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is reached with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

E. Performance Ratings: As indicated on drawings.

2.4 UPBLAST ROOF EXHAUSTERS

A. Manufacturers:

1. Carnes, a division of Carnes Company Inc; VUBK: www.carnes.com/#sle.

2. Greenheck Fan Corporation; _____: www.greenheck.com/#sle.

3. Patterson Fan Company, Inc; _____: www.pattersonfan.com/#sle.

B. Belt Drive Fan:

1. Fan Wheel:

a. Type: Non-overloading, backward inclined centrifugal.

b. Material: Aluminum, statically and dynamically balanced.

2. Housing:

a. Construct of heavy gauge aluminum including curb cap, windband, and motor compartment.

b. Rigid internal support structure.

c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.

d. Construct drive frame assembly of heavy gauge steel, mounted on vibration isolators.

e. Provide breather tube for fresh air motor cooling and wiring.

C. Shafts and Bearings:

1. Fan Shaft:

a. Ground and polished steel with anti-corrosive coating.

b. First critical speed at least 25 percent over maximum cataloged operating speed.

2. Bearings:

a. Permanently sealed or pillow block type.

b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.

c. 100 percent factory tested.

D. Drive Assembly:

1. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.

2. Belts: Static free and oil resistant.

3. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.

4. Motor pulley adjustable for final system balancing.

5. Readily accessible for maintenance.

E. Drain Trough: Allows for single-point drainage of water, grease, and other residues.

END OF SECTION 233423

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 233439 - HIGH-VOLUME, LOW-SPEED PROPELLER FANS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. High-volume, low-speed propeller fans.

1.2 RELATED REQUIREMENTS

A. Section 230513 - Common Motor Requirements for HVAC Equipment.

B. Section 230548 - Vibration Controls for HVAC Piping and Equipment.

1.3 REFERENCE STANDARDS

A. AMCA 99 - Standards Handbook; 2016.

B. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.

C. UL 507 - Electric Fans; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

1.5 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 507.

B. Static and Dynamically Balanced: Comply with AMCA 204.

C. Fabrication: Comply with AMCA 99.

D. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.2 HIGH-VOLUME, LOW-SPEED PROPELLER FANS

A. Manufacturers:

1. Big Ass Fans; Basic 6: www.bigassfans.com/#sle.

2. Greenheck; www.greenheck.com

3. Hunter Fan International; Titan: www.hunterfan.com/#sle.

B. Performance Ratings:

1. See schedules.

C. Shafts and Bearings:

1. Fan Shaft:

a. Ground and polished steel with anti-corrosive coating.

b. First critical speed at least 25 percent over maximum cataloged operating speed.

2. Bearings:

a. Permanently sealed or pillow block type.

b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.

c. 100 percent factory tested.

D. Fan Controllers:

1. Manufacturers:

a. Greenheck; _____: www.greenheck.com.

2. Factory mounted and wired.

3. Digital Fan Controllers:

a. Individually control or synchronize fan direction and speed.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure fan with stainless steel lag screws to structure.

C. Ceiling-Mounted Fans:

1. Install fans with resilient mountings and flexible electrical leads. See Section 230548.

D. Provide sheaves required for final air balance for belt-driven motors.

END OF SECTION 233439

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 233700 - AIR OUTLETS AND INLETS

PART 2 PRODUCTS

END OF SECTION 233700

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes ceiling and wall mounted diffusers, registers and grilles.

1.2 **SUBMITTALS**

A. Product Data: For each type of product indicated, include the following:

1. Data sheets: Indicate materials of construction, finish and mounting details, performance data including horizontal throw and vertical drop, total pressure and static pressure drop, and noise ratings. Include all assumptions utilized for noise ratings. Indicate thermal insulation and acoustic insulation provided with materials information. Indicate mounting type.

2. Diffuser, register and grille schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

3. Color chips: Where custom colors are required.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Titus

B. See drawing schedules, plans and details for required materials, finishes, style, sizes, pattern, performance and accessories.

1. Internal insulation of slot diffuser plenums is not allowed. All slot diffuser plenums shall be externally insulated.

2.2 **SOURCE QUALITY CONTROL**

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 EXECUTION

3.1 **EXAMINATION**

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Engineer for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, fire dampers, terminal units, control valves and other above ceiling components.

D. Do not modify slot diffuser plenums nor penetrate slot diffuser plenums for piping, conduit, cable tray or other interferences.

E. Do not install diffuser neck mounted dampers, except where specifically scheduled as noted as such. Clarify the installation of all neck mounted dampers directly with the Engineer prior to furnishing the submittal.

F. Support all slot diffusers and laminar flow diffusers independently of the ceiling. Support all other diffusers, registers and grilles which weigh more than five pounds independently of the ceiling. Support all components independently of the ceiling if so required by Division 09 ceiling specifications and CISCA recommendations.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 34 23 233713

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 235100 - BREECHINGS, CHIMNEYS, AND STACKS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Type B double wall gas vents.

1.2 REFERENCE STANDARDS

A. NFPA 54 - National Fuel Gas Code; 2015.

B. UL 441 - Standard for Gas Vents; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data indicating factory built chimneys, including dimensional details of components and flue caps, dimensions and weights, electrical characteristics and connection requirements.

C. Manufacturer's Certificate: Certify that refractory lined metal stacks meet or exceed specified requirements.

PART 2 PRODUCTS

2.1 BREECHINGS, CHIMNEYS, AND STACKS - GENERAL REQUIREMENTS

2.2 TYPE B DOUBLE WALL GAS VENTS

A. Fabrication: Inner pipe of sheet aluminum, and outer pipe of galvanized sheet steel, tested in compliance with UL 441.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 54

C. Install breechings with minimum of joints. Align accurately at connections, with internal surfaces smooth.

D. Support breechings from building structure, rigidly with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling. Support vertical breechings, chimneys, and stacks at 12 foot spacing, to adjacent structural surfaces, or at floor penetrations. Refer to SMACNA (DCS) for equivalent duct support configuration and size.

E. Pitch breechings with positive slope up from fuel-fired equipment to chimney or stack.

F. Coordinate installation of dampers, and induced draft fans

G. For Type B double wall gas vents, maintain UL listed minimum clearances from combustibles. Assemble pipe and accessories as required for complete installation.

H. Install vent dampers, locating close to draft hood collar, and secured to breeching.

I. Assemble and install stack sections in accordance with NFPA 82, industry practices, and in compliance with UL listing. Join sections with acid-resistant joint cement. Connect base section to foundation using anchor lugs.

J. Level and plumb chimney and stacks.

K. At appliances, provide slip joints permitting removal of appliances without removal or dismantling of breechings, breeching insulation, chimneys, or stacks.

L. Provide maximum 2 feet of breeching to connect appliance to chimney. Provide Type B chimney continuously from appliances.

3.2 SCHEDULES

A. Breechings, Chimneys and Stacks.

1. Furnace: Galvanized breeching, Type B chimney.

END OF SECTION 235100

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 235533 - FUEL-FIRED UNIT HEATERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tubular infrared heaters.

1.2 RELATED REQUIREMENTS

A. Section 235100 - Breechings, Chimneys, and Stacks.

1.3 REFERENCE STANDARDS

A. NFPA 54 - National Fuel Gas Code; 2015.

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

C. NFPA 211 - Guide for Smoke and Heat Venting; 2016.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate assembly, required clearances, and locations and sizes of field connections.

D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

E. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements - Project Requirements, for additional provisions.

1.5 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturers warranty for heat exchangers.

PART 2 PRODUCTS

2.1 TUBULAR INFRARED HEATERS

A. Manufacturers:

1. Roberts Gordon; www.robertsgordon.com

2. Detroit Radiant Products Company; _____: www.reverberay.com/#sle.

B. Infrared Heaters: Tubular type; packaged, partially factory assembled, pre-wired unit consisting of cabinet, burner, heat exchanger, radiant tube, reflector, controls; for natural gas.

C. Heat Exchanger: Aluminized tubular steel combustion chamber with aluminized steel tube with aluminum reflector.

D. Gas Burner:

1. Gas Burner: Forced draft type with adjustable combustion air supply.

2. Gas valve provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.

3. Electronic pilot ignition, with electric spark igniter.

4. Non-corrosive burner air blower with permanently lubricated motor.

E. Gas Burner Safety Controls: Thermo-couple sensor prevents opening of solenoid gas valve until pilot flame is proven and stops gas flow on ignition failure.

F. Operating Controls: Low voltage room thermostat cycles burner to maintain room temperature setting.

G. Performance:

1. Refer to Schedule. Gas heating capacities are sea level ratings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that space is ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available.

C. Verify that proper fuel supply is available for connection.

3.2 INSTALLATION

A. Install in accordance with NFPA 90A.

B. Install gas fired units in accordance with NFPA 54 and applicable codes.

C. Provide vent connections in accordance with NFPA 211. Refer to Section 235100.

END OF SECTION 235533

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 237223 - PACKAGED AIR-TO-AIR ENERGY RECOVERY UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Energy recovery units.

B. Casing.

C. Dampers.

1.2 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2012.

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2015.

C. AHRI 1060 (I-P) - Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment; 2014.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's installation instruction, product data, and engineering calculations.

C. Shop Drawings: Show design and assembly of energy recovery unit and installation and connection details.

1.4 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Warranty ventilator to be free from defects in material and workmanship and of all parts for period of 1-1/2 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Energy Recovery Ventilators:

1. RenewAire; _____: www.renewaire.com/#sle.

2. Ruskin Company; _____: www.ruskin.com/#sle.

B. Basis of Design: RenewAire: www.renewaire.com/#sle.

1. HE Series ERV: Static-plate, heat and humidity transfer energy recovery ventilator.

a. Indoor ERV to condition 550 cfm of outside air.

2.2 ENERGY RECOVERY UNITS

A. Energy Recovery Units: Provide dessicant wheel type or stationary core air-to-air exchanger; prefabricated packaged system designed by manufacturer.

1. Provide unit with a AHRI 1060 (I-P) compliant air-to-air exchanger.

2. Access: Hinged and/or screwed access panels on front.

3. Framing: Welded extruded aluminum tubular frame capable of supporting components and casings.

4. Permanent name plate listing manufacturer mounted inside door near electrical panel.

2.3 DAMPERS

A. Exhaust Back-Draft Damper: Factory installed, galvanized steel.

1. High performance, backdraft dampers suitable for application in HVAC systems with velocities to 3000 fpm.

2. Louvers, Dampers, and Shutters: AMCA 500-D and AMCA 500-L.

3. Damper Capacity: Demonstrate damper capacity to withstand HVAC system operating conditions.

4. Fabrication:

a. Frame: 20 gauge, 0.0359 inch, 3 inch roll formed galvanized steel channel with rear flange, prepunched mounting holes, and welded corner clips for maximum rigidity.

b. Blades:

1) Style: Single-piece, overlap frame.

2) Material: Roll formed 28 gauge, 0.0149-inch galvanized steel.

3) Width: Maximum 6 inches.

B. Return Air Damper:

1. Factory installed, adjustable volume control, opposed blade damper for regulating airflow, based on external static pressure.

2. Return Air Damper: Structural hat channels, reinforced at corners.

3. Roll-formed Frames: Structurally superior to 13 gauge, 0.0897 inch U-channel frames.

4. Blades: Single skin, 16 gauge, 0.0598 inch.

C. Motorized Dampers: Provide motorized dampers at outside air inlet, exhaust air outlet, and supply air outlet.

1. Type: Motorized two position parallel blade damper with blade seals.

2. Motorized Damper: Roll-formed structural hat channels, reinforced at the corners,

3. Blades: Single skin, 16 gauge, 0.0598 inch.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that structure is ready for installation of unit, that openings in deck for ductwork, if required, are correctly sized and located, and that mechanical and electrical utilities supplying unit are of correct capacities and are accessible.

3.2 INSTALLATION

A. Provide openings for suitable ductwork connection.

3.3 SYSTEM STARTUP

A. Provide services of manufacturer's authorized representative to provide start up of unit.

END OF SECTION 237223

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 238119 - SELF-CONTAINED AIR-CONDITIONERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Packaged terminal heat pump units.

B. Wall sleeves.

C. Louvers.

D. Controls.

1.2 RELATED REQUIREMENTS

A. Section 230913 - Instrumentation and Control Devices for HVAC: Installation of thermostats and other control components.

1.3 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.

B. AHRI 270 (SI/I-P) - Sound Performance Rating of Outdoor Unitary Equipment; 2025.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide drawings indicating dimensions, rough-in connections, and electrical characteristics and connection requirements.

C. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect finished cabinets from physical damage by leaving factory packing cases in place before installation and providing temporary covers after installation.

1.6 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide a five year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Amana; www.amana-ptac.com

B. Trane Technologies, PLC; _____: www.trane.com/#sle.

2.2 PERFORMANCE REQUIREMENTS

A. See schedules.

B. Scheduled Performance:

1. Cooling Capacity: AHRI 210/240.

2. Reverse Cycle Heating Capacity: AHRI 210/240.

3. Unit Sound Number: AHRI 270 (SI/I-P).

2.3 AIR CONDITIONING UNITS

A. Description: Packaged, self-contained, through-the-wall air cooled terminal heat pump units, with wall sleeve, room cabinet, electric refrigeration system, electric heating, outside air louvers, remote temperature controls; fully charged with refrigerant and filled with oil.

B. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

C. Energy Efficiency:

2.4 CABINET

A. Cabinet: Wall mounted of 18 gauge, 0.0478 inch galvanized steel with epoxy coated finish, removable front panel with concealed latches, _____ color as selected.

B. Discharge Grille and Access Door: Removablepunched louver discharge grilles, allowing 4-way discharge air pattern with hinged door in top of cabinet for access to controls.

2.5 WALL SLEEVES AND LOUVERS

A. Wall Sleeves: ____ inches deep, 16 gauge, 0.0598 inch galvanized steel with protective mastic coating.

B. Louvers: Provide flush anodized aluminum with enamel finish, _____ color as selected.

2.6 CHASSIS

A. Refrigeration System:

1. Direct expansion cooling coil.

2. Hermetically sealed compressor with internal spring isolation, external isolation, permanent split capacitor motor and overload protection.

3. Accumulator.

4. Condenser coil and fan.

B. Coaxial tube in tube condenser with water regulating valve.

1. Capillary restrictor and constant pressure expansion valve.

2. Reversing valve.

C. Air System: Centrifugal forward curved tangential evaporator fans with two speed permanent split capacitor motor, permanent washable filters, positive pressure ventilation damper with concealed manual operator.

D. Heating Coil: Electric.

E. Condensate Drain: Drain pan to direct condensate to condenser coil for re-evaporation.

F. Condenser Fan: Centrifugal, forward curved type with separate permanent split capacitor motor.

2.7 CONTROLS

A. Control Module: Remote mounted adjustable thermostat with heat anticipator, heat-off-cool switch, high-low fan switch.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate installation of units with architectural, mechanical, and electrical work.

END OF SECTION 238119

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 238126.13 - SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air-source heat pumps.

B. Forced air furnaces.

C. Air cooled condensing units.

D. Indoor air handling (fan and coil) units for ducted systems.

E. Indoor air handling (fan and coil) units for ductless systems.

F. Controls.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Mounting pad for outdoor unit.

B. Section 230913 - Instrumentation and Control Devices for HVAC: Thermostats, humidistats, time clocks.

C. Section 231123 - Facility Natural-Gas Piping.

D. Section 233100 - HVAC Ducts and Casings.

1.3 REFERENCE STANDARDS

A. ACGIH - Ultraviolet Radiation, TLV Physical Agents; 2010, 7th edition.

B. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.

C. AHRI 270 (SI/I-P) - Sound Performance Rating of Outdoor Unitary Equipment; 2025.

D. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

E. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.

F. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.

G. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017.

H. NFPA 54 - National Fuel Gas Code; 2015.

I. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

J. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.

K. NFPA 211 - Guide for Smoke and Heat Venting; 2016.

L. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

D. Design Data: Indicate refrigerant pipe sizing.

E. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

G. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.5 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Carrier Corporation; _____: www.carrier.com/#sle.

B. Rheem Manufacturing Company Inc; _____: www.rheem.com/#sle.

C. Trane Technologies, PLC; _____: www.trane.com/#sle.

D. Basis of Design: Trane Technologies, PLC; www.trane.com/#sle.

2.2 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.

1. Heating: Natural gas fired.

2. Cooling: Outdoor electric condensing unit with evaporator coil in central ducted indoor unit.

3. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Schedule for all requirements.

2.3 INDOOR AIR HANDLING UNITS FOR DUCTED SYSTEMS

A. Manufacturers:

1. Rheem Manufacturing Company Inc; _____: www.rheem.com/#sle.

2. Trane Technologies, PLC; _____: www.trane.com/#sle.

3. York International Corporation / Johnson Controls; _____: www.york.com/#sle.

B. Basis of Design: Trane Technologies, PLC; www.trane.com/#sle.

C. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.

1. Air Flow Configuration: Upflow.

2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.

D. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.

E. Air Filters: 2 inch thick glass fiber, disposable type arranged for easy replacement.

F. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.

1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.

2. Manufacturers: System manufacturer.

2.4 INDOOR AIR HANDLING UNITS FOR DUCTLESS SYSTEMS

A. Manufacturers:

1. ; _____: www.ouellet.com/#sle.

2. Rheem Manufacturing Company Inc; _____: www.rheem.com/#sle.

3. Trane Technologies, PLC; _____: www.trane.com/#sle.

B. Basis of Design: Trane Technologies, PLC; www.trane.com/#sle.

C. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.

D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.

1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.

2. Manufacturer: System manufacturer.

2.5 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.

1. Comply with AHRI 210/240.

2. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

3. Refrigerant: R-410A.

4. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.

B. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

C. Accessories: Filter drier, high-pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).

1. Provide thermostatic expansion valves.

D. Operating Controls:

1. Control by room thermostat to maintain room temperature setting.

E. Mounting Pad: Precast concrete parking bumpers, minimum 4 inches square; minimum of two located under cabinet feet.

2.6 GAS FURNACE COMPONENTS

A. Heat Exchanger: Aluminized steel ceramic coated clamshell type welded construction.

B. Burner: Atmospheric type with adjustable combustion air supply,

1. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.

2. Electronic pilot ignition, with electric spark igniter.

3. Combustion air damper with synchronous spring return damper motor.

4. Non-corrosive combustion air blower with permanently lubricated motor.

C. Burner Safety Controls:

1. Thermocouple Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.

2. Flame Rollout Switch: Installed on burner box and prevents operation.

3. Vent Safety Shutoff Sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.

4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.

D. Operating Controls:

1. Cycle burner by room thermostat to maintain room temperature setting.

2. Supply fan energized from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation.

3. Provide continuous low speed fan operation.

E. Flue Termination: Concentric roof kit.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

C. Verify that proper fuel supply is available for connection.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Install gas fired furnaces in accordance with NFPA 54.

D. Provide vent connections in accordance with NFPA 211.

E. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION 238126.13

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
SECTION 238416 - DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

SECTION 23 84 16 – MECHANICAL DEHUMIDIFICATION UNITS

PART 1 GENERAL

2.1 1.1. GENERAL REQUIREMENTS

A. A. Provide four (4) mechanical dehumidifiers on caster wheels for installation inside the filter building. Roller wheels shall provide the ability . Coordinate location of the dehumidifiers with the engineer/owner.

2.2 1.2. SUBMITTALS

A. A. See Section 01 31 00 – General Coordination, for submittal procedures.

B. B. Product Data: Provide catalog data indicating general assembly, dimensions, weights, materials, and certified performance ratings.

C. B. Operation Data: Include assembly instructions, float adjustment, bleed rates, and electrical requirements.

D. C. Maintenance Data: Instructions for lubrication filter replacement, cleaning and spare parts lists.

PART 2 PRODUCTS

3.1 2.1. MANUFACTURERS

A. A. Acceptable Manufacturers: Hi-E Dry 100 Dehumidifier, or equal.

3.2 2.2. MANUFACTURED UNITS

A. A. Factory assembled units consisting of casing, tank, refrigerant compressor, evaporating cooling coil, reheating condensing coil, evaporator fan, condensing fan, condensate pump, humidistat, controls and casters.

3.3 2.3. GENERAL

A. A. The dehumidifier shall be designed to treat spaces with a minimum volume of 15,000 cubic feet.

B. B. The dehumidifier shall have a minimum water removal capacity of 100 pints per day at 80°F and 60% relative humidity.

3.4 2.4. CASING

A. A. Assembly: Steel, minimum 0.0635 inch thick, reinforced and braced with steel angles with cadmium plated cap screws.

B. B. Finish: Two coats of zinc chromate, iron oxide, phenolic resin paint applied after assembly.

3.5 2.5. COOLING AND REHEAT COILS

A. A. Coils ARI 410, Copper tube and aluminum fins.

3.6 2.6. REFRIGERANT COMPRESSOR

A. A. Operates on R-410 A refrigerant.

3.7 2.7. CONDENSATE PUMP

A. A. Unit mounted pump and flexible hose.

3.8 2.8. CONTROLS.

A. A. Humidistat control of fans and compressor.

3.9 2.9. ACCESSORIES.

A. A. Inlet air filter.

B. B. Power cord.

C. C. Rolling casters, 2".

PART 3 EXECUTION

4.1 3.1. INSTALLATION

A. A. Install in accordance with manufacturer's instructions.

B. B. Connect the electrical power cord into a ground fault interrupter receptacle.

C. C. Pipe condensate hose to nearest floor drain.

3.1. WARRANTY

1. A. Manufacturer shall warranty dehumidifier for a minimum of One (1) against any defects in material and workmanship.

END OF SECTION 238416

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)
SECTION 23 84 16 – MECHANICAL DEHUMIDIFICATION UNITS

PART 1 GENERAL

1.1. GENERAL REQUIREMENTS

A. Provide Eight (8) mechanical dehumidifiers on caster wheels for installation inside the filter building. Roller wheels shall provide the ability . Coordinate location of the dehumidifiers with the engineer/owner.

1.2. SUBMITTALS

A. See Section 01 31 00 – General Coordination, for submittal procedures.

B. Product Data: Provide catalog data indicating general assembly, dimensions, weights, materials, and certified performance ratings.

B. Operation Data: Include assembly instructions, float adjustment, bleed rates, and electrical requirements.

C. Maintenance Data: Instructions for lubrication filter replacement, cleaning and spare parts lists.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Acceptable Manufacturers: Hi-E Dry 100 Dehumidifier, or equal.

2.2. MANUFACTURED UNITS

A. Factory assembled units consisting of casing, tank, refrigerant compressor, evaporating cooling coil, reheating condensing coil, evaporator fan, condensing fan, condensate pump, humidistat, controls and casters.

2.3. GENERAL

A. The dehumidifier shall be designed to treat spaces with a minimum volume of 15,000 cubic feet.

B. The dehumidifier shall have a minimum water removal capacity of 100 pints per day at 80°F and 60% relative humidity.

2.4. CASING

A. Assembly: Steel, minimum 0.0635 inch thick, reinforced and braced with steel angles with cadmium plated cap screws.

B. Finish: Two coats of zinc chromate, iron oxide, phenolic resin paint applied after assembly.

2.5. COOLING AND REHEAT COILS

A. Coils ARI 410, Copper tube and aluminum fins.

2.6. REFRIGERANT COMPRESSOR

A. Operates on R-410 A refrigerant.

2.7. CONDENSATE PUMP

A. Unit mounted pump and flexible hose.

2.8. CONTROLS.

A. Humidistat control of fans and compressor.

2.9. ACCESSORIES.

A. Inlet air filter.

B. Power cord.

C. Rolling casters, 2".

PART 3 EXECUTION

3.1. INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Connect the electrical power cord into a ground fault interrupter receptacle.

C. Pipe condensate hose to nearest floor drain.

3.1. WARRANTY

A. Manufacturer shall warranty dehumidifier for a minimum of One (1) against any defects in material and workmanship.

END OF SECTION 23 84 17

DIVISION 26 - ELECTRICAL
SECTION 26 00 10 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section supplements Division 1, General Requirements.

B. Where contradictions occur between this Section and Division 1, the more stringent of the two shall apply. Architect shall decide which is most stringent.

C. Provisions of this section shall also apply to all sections of Division 26, and Division 27.

D. The specifications are complementary to the drawings and their requirements shall have the same priority as the drawings.

1.2 COORDINATION WITH OTHER TRADES

A. Contract Documents:

1. General: The Contract Documents are diagrammatic, showing certain physical relationships which must be established within the electrical work and its interface with other work. Such establishment is the exclusive responsibility of the Contractor. Drawings shall not be scaled for the purpose of establishing material quantities.

2. Work out all conditions in advance of installation. If necessary, and before work proceeds in those areas, prepare coordination drawings showing all work in congested areas. Provide additional work necessary to overcome congested conditions at no increase in contract sum.

3. Coordinate the electrical work to the progress of the work of other trades.

4. Complete the entire installation as soon as the condition of the building will permit.

5. Coordinate ceiling cavity space carefully with all trades. In the event of conflict, install electrical and electric systems within the cavity space allocation in the following order:

a. Lighting.

b. Plumbing piping.

c. Mechanical ductwork.

d. Air diffusers.

e. Domestic water piping.

B. Discrepancies:

1. Examine Drawings and Specifications.

2. Report any discrepancies to the Architect and obtain written instructions before proceeding.

3. Should there be a conflict within or between the Specifications or Drawings, the more stringent or higher quality requirements shall apply. The determination of the more stringent or higher quality shall lie with the Architect.

4. Items called for in either specifications or drawings shall be required as if called for in both.

5. Provide proper documentation of equipment product data and shop drawings to all entities providing service.

6. Coordination Drawings:

a. Coordination drawings shall be submitted by the Contractor for all electrical work above ceilings. Drawings shall include all ductwork and elevations; ceiling height and bottom of structure; lighting; all piping and conduit greater than 2.5” in diameter; equipment and its required maintenance clearances.

b. Clearly indicate solutions to space problems. Identification of space problems without solutions is not acceptable. Only areas clearly identified will be reviewed.

c. Acceptance by the Architect does not imply acceptance of any deviations from Contract Documents requirements or acceptance of uncoordinated work. Review is for general conformance to the design concept and general compliance with the information given in the Contract Documents.

d. Prepare Coordination Drawings at a 1/4" = 1'-0" scale, showing the required dimensions. In addition to the mentioned areas above, also submit the following:

1) All electrical equipment rooms such as fan rooms, boiler rooms, chiller rooms, etc.

2) Indicate all major piping, electrical equipment and conduits, Structural and Architectural elements in these areas as well. Provide all necessary sections and elevations for clarification.

3) When electronic Building Information Modeling (BIM) files have been provided to the contractor, the Contractor shall only consider the files as design to only show the intent of the design. The Contractor shall be responsible for the Coordination drawings based on the design.

4) Utility Connections:

a) Coordinate the connection of electrical systems with utilities.

b) Comply with requirements of utilities.

c) Coordinate electrical utility interruptions at least one week in advance with the Owner and the Utility Company unless otherwise indicated.

d) Plan work so that duration of the interruption is kept to a minimum.

1.3 COORDINATION WITH EXISTING OCCUPIED AREAS

A. Minimize disruptions to operation of electrical systems in occupied areas.

B. Coordinate any required disruptions with the Owner, one week in advance.

C. Provide temporary connections to prevent long disruptions.

1.4 DELEGATED DESIGN BY CONTRACTOR

A. The construction of this building requires the Contractor to design several systems or subsystems. All such designs shall be the complete responsibility of the Contractor.

B. Systems or subsystems which require engineering responsibility by the Contractor include, but are not limited to:

1. Any system not fully detailed.

2. Equipment supports, not fully detailed.

3. Conduit hangers and anchors not specified in these documents, or cataloged by the manufacturer.

4. Lighting controls and wiring.

5. Conduit systems for Video, Data, Process Controls, and Instrumentation.

1.5 REGULATORY REQUIREMENTS

A. Codes: Comply with the codes adopted by authority having jurisdiction which shall include but not be limited to:

1. NFPA 70 National Electrical Code (NEC)

2. Applicable editions of NFPA.

3. Requirements of Fire Departments serving the project.

4. Regulations of the Health Department having jurisdiction.

5. Regulations of the Office of State Fire Marshal or its equivalent.

6. Americans with Disabilities Act (ADA).

B. Requirements of Local Utility Companies:

1. Comply with rules and requirements of local utility companies.

2. Include in bid the cost of all Electric Utility service fees, EUSERC cabinets, meter boxes, meters, conduit, and such equipment which will be required for the project.

C. Other Regulations: Comply with the latest applicable regulations and ordinances of the following:

1. U. S. and State Department of Labor Safety Regulations pertaining to the completed project.

2. Clean Air Act.

3. Clean Water Act.

4. Requirements of product listings by nationally recognized listing agencies as recognized by the Occupational Safety and Hazards Agency (OSHA).

D. Follow the most stringent where Codes are contradictory, unless otherwise indicated in Contract Documents. Architect shall determine which is most stringent.

E. Codes are a minimum requirement approved by the AHJ. Comply with Project Documents when they exceed the requirements of the codes.

F. Inspections and Tests:

1. Inspections and tests required shall be completed by a third party NETA Testing Agency/Contractor. Arrange for all required inspections and testing.

2. Contractor shall pay all inspections and testing charges.

3. Notify Architect two (2) business days before tests.

4. Submit inspections reports and Test Reports to the Architect for review. Include in the final Record Documents.

1.6 OWNER-FURNISHED EQUIPMENT

A. All equipment called out in the Specifications or shown on the Drawings as "Owner-Furnished Equipment" or equipment furnished by other Divisions shall be installed and connected as required for a complete and operational system.

B. Provide rough-ins for all future connections indicated.

1.7 INSTALLATION GENERAL REQUIREMENTS

A. Furnish, apply, install, connect, erect, clean, and condition manufactured materials and equipment as recommended in manufacturer's printed directions. Maintain manufacturer's printed directions on job site during installation.

B. Provide all attachment devices and materials necessary to secure materials together or to other materials.

C. llow for ample and normal expansion and contraction for all building components and piping systems that are subject to such.

D. Install materials only when conditions of temperature, moisture, humidity, and conditions of adjacent building components are conductive to achieving the best installation results.

E. Erect, install, and secure components in a structurally sound and appropriate manner.

F. Temporarily brace, shore, or otherwise support members until final connections are installed.

G. Leave all temporary bracing, shoring, or other structural supports in place as long as practical for safety and to maintain proper alignment.

H. Handle materials in a manner to prevent scratching, abrading, distortion, chipping, breaking, or other disfigurement.

I. Conduct work in a manner to avoid damage to previously placed work. Any work so impaired or damaged shall be replaced at no expense to Owner.

J. Fabricate and install materials true to line, plumb, and level.

K. Leave finished surfaces smooth and flat, free from wrinkles, warps, scratches, dents, and other imperfections.

L. Furnish materials in longest practical lengths and largest practical sizes to avoid all unnecessary jointing.

M. Make all joints secure, tightly fitted, and as inconspicuous as possible by the best accepted practice in joining and fabricating.

N. Contact Architect for mounting height or position of any unit not specifically indicated or located on Drawings or specified in Specifications.

O. Job mixed multi-component materials used in the work shall be mixed in such regulated and properly sized batches that material can be used before it begins to "set."

P. Mixing of a partially "set" batch with another batch of fresh materials will not be accepted and entire batch shall be discarded and removed from site.

Q. Clean all mixing tools and appliances that can be contaminated prior to mixing of fresh materials.

R. In addition to the above, refer to each Section of the Specifications for additional installation requirements for the proper completion of all work.

PART 2 - PRODUCTS

2.1 GENERAL

A. Certain products are specified without equals. Substitutions for these will not be considered.

B. Follow substitution instructions in Front End Documents for any manufacturer not listed in the Project Manual or the drawings that the Contractor may want considered for substitution.

C. Coordination of general equivalents and substitutions: Where Contract Documents permit selection from several general equivalents, or where substitutions are authorized, coordinate clearance and other interface requirements with electrical and other work.

1. Provide necessary additional items so that selected or substituted item operates equivalent to the basis of design and properly fits in the available space allocated for the basis of design.

2. Provide all features which are standard and specified on the basis of design.

3. Contractor is responsible for assuring that piping, conduit, duct, flue, and other service locations for general equivalents or substitutions do not cause access, service, or operational difficulties any greater than would be encountered with the basis of design. Acceptance by the Architect does not imply acceptance of any deviations from contract documents.

4. Confirm if modifications to electrical, structural or architectural requirements for substituted or general equivalents are needed such as: wire size, conduit size, MCA, MOCP, weight, support, etc. Coordinate with General and Electrical Contractor prior to bid.

PART 3 – EXECUTION

3.1 COORDINATION OF ELECTRICAL INSTALLATION.

A. Inspection and Preparation:

1. Examine the work interfacing with electrical work, and the conditions under which the work will be performed, and notify the Architect of conditions detrimental to the proper completion of the work.

2. Do not proceed with the work until unsatisfactory conditions have been corrected. Lack of notifying Architect of conditions is in no way cause for change order request.

B. Layout:

1. Layout the electrical work in conformity with the Contract Drawings, Coordination Drawings and other Shop Drawings, product data and similar requirements so that the entire electrical system is an integrated system, properly

interfaced with other work, recognizing that portions of the work are shown only in diagrammatic form.

2. Comply with the Architect's decision on resolution of a conflict where coordination requirements conflict with individual system requirements.

3. Take necessary field measurements to determine space and connection requirements.

4. Provide sizes and shapes of equipment so the final installation conforms to the intent of the Contract Documents.

C. Integrate electrical work in ceiling spaces with suspension system, light fixtures and other work so that required performances of each will be achieved.

3.2 PRODUCT INSTALLATION

A. Manufacturer's Instructions:

1. Comply with the product manufacturer's instructions and recommendations except where more stringent requirements are indicated.

2. Consult with manufacturer's technical representatives, who are recognized as technical experts, for specific instructions on special project conditions.

3. Notify the Architect in writing if a conflict exists and obtain his instruction before proceeding with the work in question.

B. Movement of Equipment:

1. Arrange for the movement and positioning of equipment so that enclosing partitions, walls and roofs will not be delayed or need to be removed.

2. Advise Contractor of opening requirements to be maintained for the subsequent entry of equipment.

C. Heavy Equipment:

1. Coordinate the movement of heavy items with shoring and bracing so that the building structure will not be overloaded during the movement and installation.

2. Do not transport across the roof deck electrical equipement that is too heavy for hand-carry. Set by crane or other device to avoid overloading the roof deck.

D. Support:

1. Anchor and secure all equipment to the building substrate and structure.

E. Clearances:

1. Install conduit and cables:

a. Straight and true.

b. Aligned with other work and with general lines of the building.

c. Concealed, where possible, in occupied spaces.

d. Out of the way with maximum passageway and headroom remaining in each space.

2. Except as otherwise indicated, arrange electrical services and overhead equipment with a minimum of:

a. 7'6" headroom in storage spaces. Do not obstruct windows, doors or other openings.

3. Give the right-of-way to piping systems required to slope for drainage (over other service lines and ductwork).

3.3 PROTECTION OF WORK

A. All conduit ends, panelboards, motor controls, disconnecting means, and equipment left unconnected shall be capped, plugged or otherwise properly protected to prevent damage or the intrusion of foreign matter.

B. Equipment or conduit system found to have been damaged or contaminated shall be replaced or cleaned to the Engineer's satisfaction.

3.4 ADJUSTING

A. Adjust all equipment and system components as shown or as otherwise required to result in intended system operation.

B. At completion of work, provide written certification that all systems are functioning properly without defects.

3.5 START-UP

A. Contractor shall assign a Start-Up Coordinator for his portion of work on the project.

B. The Start-Up Coordinator shall develop detailed start-up procedures, equipment checkout procedure and data forms for recording compliance with contract document performance criteria, and will assist in developing schedules for checkout and Owner acceptance.

C. The Start-Up Coordinator shall be responsible for maintaining documentation of Start-Up activities until final acceptance of the project.

D. The documentation shall be kept current by the Start-Up Coordinator and shall be available for inspection at all times. At the time of acceptance of the project, the Start-Up Coordinator shall submit 3 completed copies of the documentation to the Owner's representative.

1. Coordinate with the mechanical installation the requirements for the startup of mechanical and plumbing systems:

a. All equipment, components, and systems have been set, started-up, and adjusted including checking the following: proper equipment electrical rotation, control connections, factory trained technician startup, etc.

b. All electric power connections, disconnects, fuses, circuit breakers, etc. are properly sized and installed.

3.6 TRAINING

A. Refer to Division 1 sections of the specifications regarding requirements of Record Drawings, Operation and Maintenance Manual submittal and systems training.

1. Demonstrate that each system operates properly.

2. Explain the operation of each system to the Owner's Representative.

3. Explain use of O&M manual in operating and maintaining systems.

4. Coordinate date, time, and duration of training with Owner.

5. Develop training agendas and schedules and submit for approval by Owner, Commissioning Authority, Engineer, and Architect prior to training.

6. Document and submit to owner the training sessions on USB flash drive and placed in O & M Manuals. At the end of all sessions, compile all sessions on a single USB flash drive and turn over to owner as part of the O & M manuals.

B. Refer to individual Division 26 sections for specific systems requiring extended instruction.

END OF SECTION 26 00 10

DIVISION 26 - ELECTRICAL
SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Metal-clad cable.

C. Variable-frequency drive cable.

D. Wiring connectors.

E. Electrical tape.

F. Heat shrink tubing.

G. Oxide inhibiting compound.

H. Wire pulling lubricant.

I. Cable ties.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).

C. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

D. FS A-A-59544 - Cable and Wire, Electrical (Power, Fixed Installation); 2008a (Validated 2019).

E. IEEE 1210 - IEEE Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable; 2004 (Corrigendum 2014).

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

G. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.

H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

I. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. NFPA 79 - Electrical Standard for Industrial Machinery; 2021.

L. UL 4 - Armored Cable; Current Edition, Including All Revisions.

M. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

N. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

O. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

P. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

Q. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

R. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

S. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

T. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Field Quality Control Test Reports.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

1. Exceptions:

a. Use variable-frequency drive cable for connection between variable-frequency motor controllers and associated motors.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Armored cable is not permitted.

G. Metal-clad cable is permitted only as follows:

1. Where not otherwise restricted, may be used:

a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.

1) Maximum Length: 6 feet.

2. In addition to other applicable restrictions, may not be used:

a. Where exposed to view.

b. Where exposed to damage.

c. For damp, wet, or corrosive locations.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.

H. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.

I. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

J. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.

a. Exceptions:

1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.

2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.

3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.

2. Control Circuits: 14 AWG.

K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

L. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

2. Color Coding Method: Integrally colored insulation.

a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.

3. Color Code:

a. 480Y/277 V, 3 Phase, 4 Wire System:

1) Phase A: Brown.

2) Phase B: Orange.

3) Phase C: Yellow.

4) Neutral/Grounded: Gray.

b. 208Y/120 V, 3 Phase, 4 Wire System:

1) Phase A: Black.

2) Phase B: Red.

3) Phase C: Blue.

4) Neutral/Grounded: White.

c. Equipment Ground, All Systems: Green.

d. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

e. For control circuits, comply with manufacturer's recommended color code.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:

1. Copper Building Wire:

a. Cerro Wire LLC: www.cerrowire.com.

b. Encore Wire Corporation: www.encorewire.com.

c. General Cable Technologies Corporation: www.generalcable.com.

d. Southwire Company: www.southwire.com.

e. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:

1. Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Solid.

b. Size 8 AWG and Larger: Stranded.

2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:

1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

a. Installed Underground: Type XHHW-2.

2.4 METAL-CLAD CABLE

A. Manufacturers:

1. AFC Cable Systems Inc: www.afcweb.com.

2. Encore Wire Corporation: www.encorewire.com.

3. Service Wire Co: www.servicewire.com.

4. Southwire Company: www.southwire.com.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:

1. Size 10 AWG and Smaller: Solid.

2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Provide dedicated neutral conductor for each phase conductor.

G. Grounding: Full-size integral equipment grounding conductor.

H. Armor: Steel, interlocked tape.

2.5 VARIABLE-FREQUENCY DRIVE CABLE

A. Manufacturers:

1. Service Wire Co; ServiceDrive: www.servicewire.com.

2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Flexible motor supply cable listed and labeled as complying with UL 2277 in accordance with NFPA 79; specifically designed for use with variable frequency drives and associated nonlinear power distortions.

C. Conductor Stranding: Stranded.

D. Insulation Voltage Rating: 1000 V.

E. Insulation: Use only thermoset insulation types; thermoplastic insulation types are not permitted.

F. Grounding: Full-size integral equipment grounding conductor or symmetrical arrangement of multiple conductors of equivalent size.

G. Provide metallic shielding.

H. Jacket: PVC or Chlorinated Polyethylene (CPE).

2.6 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.

C. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.

2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.

2. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.

3. Copper Conductors Size 8 AWG and Larger: Use compression connectors where connectors are required.

4. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

1. Manufacturers:

a. 3M: www.3m.com.

b. Ideal Industries, Inc: www.idealindustries.com.

c. NSI Industries LLC: www.nsiindustries.com.

d. Substitutions: See Section 01 60 00 - Product Requirements.

G. Mechanical Connectors: Provide bolted type.

1. Manufacturers:

a. Burndy LLC: www.burndy.com.

b. Ilsco: www.ilsco.com.

c. Thomas & Betts Corporation: www.tnb.com.

d. Substitutions: See Section 01 60 00 - Product Requirements.

H. Compression Connectors: Provide circumferential type or hex type crimp configuration.

1. Manufacturers:

a. Burndy LLC: www.burndy.com.

b. Ilsco: www.ilsco.com.

c. Thomas & Betts Corporation: www.tnb.com.

d. Substitutions: See Section 01 60 00 - Product Requirements.

I. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

1. Manufacturers:

a. Burndy LLC: www.burndy.com.

b. Ilsco: www.ilsco.com.

c. Thomas & Betts Corporation: www.tnb.com.

d. Substitutions: See Section 01 60 00 - Product Requirements.

2.7 ACCESSORIES

A. Electrical Tape:

1. Manufacturers:

a. 3M: www.3m.com.

b. Plymouth Rubber Europa: www.plymouthrubber.com.

c. Substitutions: See Section 01 60 00 - Product Requirements.

2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.

5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.

6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.

7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Wire Pulling Lubricant:

1. Manufacturers:

a. 3M: www.3m.com.

b. American Polywater Corporation: www.polywater.com.

c. Ideal Industries, Inc: www.idealindustries.com.

d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Listed and labeled as complying with UL 267.

3. Suitable for use with conductors/cables and associated insulation/jackets to be installed.

4. Suitable for use at installation temperature.

D. Cable Ties: Material and tensile strength rating suitable for application.

E. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.

2. When circuit destination is indicated without specific routing, determine exact routing required.

3. Arrange circuiting to minimize splices.

4. Include circuit lengths required to install connected devices within 10 ft of location indicated.

5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.

6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.

7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.

8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.

2. Pull all conductors and cables together into raceway at same time.

3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.

4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.

2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

H. Terminate cables using suitable fittings.

1. Metal-Clad Cable (Type MC):

a. Use listed fittings.

b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

I. Variable-Frequency Drive Cable: Terminate shielding at both variable-frequency motor controller and associated motor using glands or termination kits recommended by manufacturer.

J. Install conductors with a minimum of 12 inches of slack at each outlet.

K. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

L. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

M. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

N. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.

2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.

3. Do not remove conductor strands to facilitate insertion into connector.

4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

O. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.

b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.

2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.

b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.

3. Wet and Damp Locations: Use heat shrink tubing.

P. Insulate ends of spare conductors using vinyl insulating electrical tape.

Q. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

R. Identify conductors and cables in accordance with Section 26 05 53.

S. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

T. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION 26 05 19

DIVISION 26 - ELECTRICAL
SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

F. Ground access wells.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

1. Includes oxide inhibiting compound.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 56 00 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.3 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify exact locations of underground metal water service pipe entrances to building.

2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Field quality control test reports.

E. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:

1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.

2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method or alternate test described in IEEE 81.

3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

E. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.

a. Provide continuous grounding electrode conductors without splice or joint.

b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

2. Metal Underground Water Pipe(s):

a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.

b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.

c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.

3. Metal In-Ground Support Structure:

a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.

4. Concrete-Encased Electrode:

a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.

5. Ground Rod Electrode(s):

a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.

b. Space electrodes not less than 20 feet from each other and any other ground electrode.

c. Locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.

d. Provide ground access well for first connected electrode.

6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.

   a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.

   b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.

   c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

8. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.

F. Service-Supplied System Grounding:

1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.

2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Separately Derived System Grounding:

1. Separately derived systems include, but are not limited to:

   a. Transformers (except autotransformers such as buck-boost transformers).

   b. Uninterruptible power supplies (UPS), when configured as separately derived systems.

2. Provide grounding electrode conductor to connect derived system grounded conductor to common grounding electrode conductor ground riser. Unless

otherwise indicated, make connection at neutral (grounded) bus in source enclosure.

3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.

4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.

5. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.

6. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.

7. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

H. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.

4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.

6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:

   a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.

   b. Metal gas piping.

   c. Metal process piping.

8. Provide bonding for interior metal air ducts.

9. Provide bonding for metal building frame.

I. Communications Systems Grounding and Bonding:

1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.

2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.

   a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.

   b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.

   c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.

   d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

J. Pole-Mounted Luminaires: Also comply with Section 26 56 00.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.

2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:

1. Use insulated copper conductors unless otherwise indicated.

a. Exceptions:

1) Use bare copper conductors where installed underground in direct contact with earth.

2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.

3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

a. Exceptions:

1) Use exothermic welded connections for connections to metal building frame.

4. Manufacturers - Mechanical and Compression Connectors:

a. Advanced Lightning Technology (ALT): www.altfab.com.

b. Burndy LLC: www.burndy.com.

c. Harger Lightning & Grounding: www.harger.com.

d. nVent ERICO; _____: www.nvent.com/#sle.

e. Thomas & Betts Corporation: www.tnb.com.

f. Substitutions: See Section 01 60 00 - Product Requirements.

5. Manufacturers - Exothermic Welded Connections:

a. Burndy LLC: www.burndy.com.

b. nVent ERICO; Cadweld: www.nvent.com/#sle.

c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com.

d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.

2. Size: As indicated.

3. Holes for Connections: As indicated or as required for connections to be made.

4. Manufacturers:

a. Advanced Lightning Technology (ALT): www.altfab.com.

b. Harger Lightning & Grounding: www.harger.com.

c. nVent ERICO: www.nvent.com/#sle.

d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com.

e. Substitutions: See Section 01 60 00 - Product Requirements.

E. Ground Rod Electrodes:

1. Comply with NEMA GR 1.

2. Material: Copper-bonded (copper-clad) steel.

3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.

5. Manufacturers:

   a. Advanced Lightning Technology (ALT): www.altfab.com.

   b. Galvan Industries, Inc: www.galvanelectrical.com.

   c. Harger Lightning & Grounding: www.harger.com.

   d. nVent ERICO: www.nvent.com/#sle.

   e. Substitutions: See Section 01 60 00 - Product Requirements.

F. Ground Access Wells:

1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.

   a. Areas Exposed to Vehicular Traffic: Rated for not less than 8,000 pounds vertical design load.

2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.

   a. Round Wells: Not less than 8 inches in diameter.

   b. Rectangular Wells: Not less than 12 by 12 inches.

3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.

4. Cover: Factory-identified by permanent means with word "GROUND".

5. Manufacturers:

   a. Advanced Lightning Technology (ALT): www.altfab.com.

   b. Harger Lightning & Grounding: www.harger.com.

   c. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70.

1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.

2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.

D. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.

4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION 26 05 26

DIVISION 26 - ELECTRICAL
SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 Section Includes

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 Related Requirements

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.

C. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

D. Section 26 05 33.16 - BOXES: Additional support and attachment requirements for boxes.

E. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

F. Section 26 56 00 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.3 Reference Standards

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.4 Administrative Requirements

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.

2. Coordinate work to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.

4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.

5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 30 00.

1.5 Submittals

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

D. Installer's qualification statement.

E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 Quality Assurance

A. Maintain at project site one copy of each referenced document that prescribes execution requirements.

B. Installer Qualifications for Powder-Actuated Fasteners: Certified by fastener system manufacturer with current operator's license.

C. Installer Qualifications for Field Welding: See Section 05 50 00.

D. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 Delivery, Storage, and Handling

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 Support and Attachment Components

A. General Requirements:

1. Comply with the following. Where requirements differ, comply with most stringent.

a. NFPA 70.

b. Requirements of authorities having jurisdiction.

2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.

3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.

4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to

be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

5. Do not use products for applications other than as permitted by NFPA 70 and product listing.

6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.

    a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.

    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

    c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

    d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Materials for Metal Fabricated Supports: See Section 05 50 00.

C. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.

1. Manufacturers:

    a. ABB: www.electrification.us.abb.com.

    b. Eaton Corporation: www.eaton.com.

    c. Emerson Electric Co; O-Z/Gedney: www.emerson.com.

    d. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com.

    e. nVent; Caddy: www.nvent.com.

    f. Substitutions: See Section 01 60 00 - Product Requirements.

2. Conduit Straps: One-hole or two-hole type; steel or malleable iron.

3. Conduit Clamps: Bolted type unless otherwise indicated.

D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

1. Manufacturers:

a. ABB: www.electrification.us.abb.com/#sle.

b. Eaton Corporation: www.eaton.com/#sle.

c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.

d. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.

e. nVent; Caddy: www.nvent.com/#sle.

f. Substitutions: See Section 01 60 00 - Product Requirements.

E. Metal Channel/Strut Framing Systems:

1. Manufacturers:

a. ABB: www.electrification.us.abb.com/#sle.

b. Atkore International Inc; Unistrut: www.unistrut.us/#sle.

c. Substitutions: See Section 01 60 00 - Product Requirements.

d. Source Limitations: Furnish channel/strut and associated fittings, accessories, and hardware produced by single manufacturer.

2. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.

3. Comply with MFMA-4.

4. Channel Material:

a. Indoor Dry Locations: Use zinc-plated steel or galvanized steel.

b. Outdoor and Damp or Wet Indoor Locations: Use stainless steel.

5. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.

6. Minimum Channel Dimensions: 1-5/8 inch wide by 13/16 inch high.

F. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

1. Minimum Size, Unless Otherwise Indicated or Required:
    a. Equipment Supports: 1/2-inch diameter.
    b. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.
    c. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.
    d. Trapeze Support for Multiple Conduits: 3/8-inch diameter.
    e. Outlet Boxes: 1/4-inch diameter.
    f. Luminaires: 1/4-inch diameter.

G. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Manufacturers:
    a. Atkore International Inc; Unistrut: www.unistrut.us/#sle.
    b. Eaton Corporation: www.eaton.com/#sle.
    c. Green Link, Inc: www.greenlinkengineering.com/#sle.
    d. PHP Systems/Design: www.phpsd.com/#sle.
    e. Substitutions: See Section 01 60 00 - Product Requirements.
2. Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.
3. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
4. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
5. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

H. Anchors and Fasteners:
1. Manufacturers - Mechanical Anchors:
    a. Dewalt: anchors.dewalt.com/#sle.

b. Hilti, Inc: www.hilti.com/#sle.

c. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com/#sle.

d. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.

e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

3. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

4. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

5. Hollow Masonry: Use toggle bolts.

6. Hollow Stud Walls: Use toggle bolts.

7. Steel: Use beam clamps, machine bolts, or welded threaded studs.

8. Sheet Metal: Use sheet metal screws.

9. Wood: Use wood screws.

10. Plastic and lead anchors are not permitted.

11. Powder-actuated fasteners are not permitted.

12. Hammer-driven anchors and fasteners are not permitted.

13. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.

    a. Manufacturer: Same as manufacturer of metal channel/strut framing system.

    b. Comply with MFMA-4.

    c. Channel Material: Use galvanized steel.

    d. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.

14. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.1 Examination

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 Installation

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

H. Field Welding, Where Approved by Architect: See Section 05 50 00.

I. Equipment Support and Attachment:

1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.

2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

4. Unless otherwise indicated, mount floor-mounted equipment on properly sized concrete pad 4 inches in height; see Section 03 30 00.

5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

J. Conduit Support and Attachment: See Section 26 05 33.13 for additional requirements.

K. Box Support and Attachment: See Section 26 05 33.16 for additional requirements.

L. Interior Luminaire Support and Attachment: See Section 26 51 00 for additional requirements.

M. Exterior Luminaire Support and Attachment: See Section 26 56 00 for additional requirements.

N. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

O. Secure fasteners in accordance with manufacturer's recommended torque settings.

P. Remove temporary supports.

Q. Identify independent electrical component support wires above accessible ceilings, where permitted, with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.3 Field Quality Control

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 26 05 29

DIVISION 26 - ELECTRICAL
SECTION 26 05 33.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Galvanized steel intermediate metal conduit (IMC).

C. Liquidtight flexible metal conduit (LFMC).

D. Galvanized steel electrical metallic tubing (EMT).

E. Rigid polyvinyl chloride (PVC) conduit.

F. Liquidtight flexible nonmetallic conduit (LFNC).

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

1. Includes additional requirements for fittings for grounding and bonding.

D. Section 26 05 29 - Hangers and Supports for Electrical Systems.

E. Section 26 05 33.16 - BOXES.

F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 21 00 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.

F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.

G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

L. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

M. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

N. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

P. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

Q. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

R. UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.

S. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.

T. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.

3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.

4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.

5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

C. Shop Drawings:

1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.

2. Include proposed locations of roof penetrations and proposed methods for sealing.

D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

1.6 QUALITY ASSURANCE

A. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.

B. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use rigid PVC conduit.

2. Exterior, Direct-Buried: Use rigid PVC conduit.

3. Exterior, Embedded Within Concrete: Use rigid PVC conduit.

4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) where emerging from underground.

5. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows, galvanized steel intermediate metal conduit (IMC) elbows, or concrete-encased PVC elbows for bends.

6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely

corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection.

D. Embedded Within Concrete:

1. Within Slab on Grade: Not permitted.

2. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

E. Concealed Within Masonry Walls: Use galvanized steel electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use schedule 80 rigid PVC conduit.

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC).

1. Locations subject to physical damage include, but are not limited to:

a. Where exposed below 8 feet, except within electrical and communication rooms or closets.

b. Where exposed below 20 feet in warehouse areas.

K. Exposed, Exterior: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC).

M. Corrosive Locations Above Ground: Use schedule 80 rigid PVC conduit.

1. Corrosive locations include, but are not limited to:

a. Water treatment facilities.

b. Chemical storage areas.

N. Flexible Connections to Luminaires Above Accessible Ceilings:

1. Non Damp, Wet or Corrosive Locations: Use flexible metal conduit (FMC).

2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).

3. Maximum Length: 6 feet.

O. Flexible Connections to Vibrating Equipment :

1. Dry Locations: Use flexible metal conduit (FMC).

2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).

3. Maximum Length: 6 feet unless otherwise indicated.

4. Vibrating equipment includes, but is not limited to:

a. Transformers.

b. Motors.

2.2 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Electrical Service Conduits: See Section 26 21 00 for additional requirements.

C. Fittings for Grounding and Bonding: See Section 26 05 26 for additional requirements.

D. Provide conduit, fittings, supports, and accessories required for complete raceway system.

E. Provide products listed, classified, and labeled as suitable for purpose intended.

F. Minimum Conduit Size, Unless Otherwise Indicated:

1. Branch Circuits: 3/4 inch (21 mm) trade size.
2. Branch Circuit Homeruns: 3/4-inch trade size.
3. Control Circuits: 3/4 inch (21 mm) trade size.
4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
5. Underground, Interior: 1-inch trade size.
6. Underground, Exterior: 1 inch (27 mm) trade size.

G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedeg.com.
2. Republic Conduit: www.republic-conduit.com.
3. Wheatland Tube Company: www.wheatland.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:

1. Manufacturers:
   a. ABB; T&B: www.electrification.us.abb.com/#sle.
   b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
   c. Bridgeport Fittings Inc: www.bptfittings.com.
   d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
   e. Substitutions: See Section 01 60 00 - Product Requirements.
2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.

3. Material: Use steel or malleable iron.

    a. Do not use die cast zinc fittings.

4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.4 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedeg.com.

2. Republic Conduit: www.republic-conduit.com.

3. Western Tube, a division of Zekelman Industries: www.westerntube.com.

4. Wheatland Tube Company: www.wheatland.com.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:

1. Manufacturers:

    a. ABB; T&B: www.electrification.us.abb.com/#sle.

    b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.

    c. Bridgeport Fittings Inc: www.bptfittings.com.

    d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.

    e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.

3. Material: Use steel or malleable iron.

    a. Do not use die cast zinc fittings.

4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.5 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:

1. AFC Cable Systems, Inc: www.afcweb.com.
2. Electri-Flex Company: www.electriflex.com.
3. International Metal Hose: www.metalhose.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

C. Fittings:

1. Manufacturers:
   a. ABB; T&B: www.electrification.us.abb.com/#sle.
   b. Bridgeport Fittings Inc: www.bptfittings.com.
   c. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
   d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.

2.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:

1. AFC Cable Systems, Inc: www.afcweb.com.
2. Electri-Flex Company: www.electriflex.com.
3. International Metal Hose: www.metalhose.com.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:

1. Manufacturers:

a. ABB; T&B: www.electrification.us.abb.com/#sle.

b. Bridgeport Fittings Inc: www.bptfittings.com.

c. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.

d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.

a. Do not use die cast zinc fittings.

2.7 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedeg.com.

2. Republic Conduit: www.republic-conduit.com.

3. Rymco USA: www.rymcousa.com/#sle.

4. Western Tube, a division of Zekelman Industries: www.westerntube.com.

5. Wheatland Tube Company: www.wheatland.com.

6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:

1. Manufacturers:

a. ABB; T&B: www.electrification.us.abb.com/#sle.

b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.

c. Bridgeport Fittings Inc: www.bptfittings.com.

d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.

e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel.

a. Do not use die cast zinc fittings.

4. Connectors and Couplings: Use compression (gland) type.

a. Do not use indenter type connectors and couplings.

5. Damp or Wet Locations, Where Permitted: Use fittings listed for use in wet locations.

6. Embedded Within Concrete, Where Permitted: Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.8 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:

1. ABB; Carlon: www.carlon.com/#sle.

2. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.

3. Cantex Inc: www.cantexinc.com.

4. JM Eagle: www.jmeagle.com.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless

otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.

2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.9 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

A. Manufacturers:

1. AFC Cable Systems, Inc: www.afcweb.com.

2. Electri-Flex Company: www.electriflex.com.

3. International Metal Hose: www.metalhose.com.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.

C. Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for type of conduit to be connected.

2.10 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

E. Foam Conduit Sealant:

1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.

2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.

3. Rated to hold minimum of 10 ft water head pressure.

4. Products:

   a. American Polywater Corporation; Polywater AFT Foam Duct Sealant: www.polywater.com/#sle.

   b. American Polywater Corporation; Polywater FST Foam Duct Sealant: www.polywater.com/#sle.

   c. Substitutions: See Section 01 60 00 - Product Requirements.

F. Conduit Mechanical Seals:

1. Listed as complying with UL 514B.

2. Specifically designed for sealing conduit openings against water, moisture, gases, and dust.

3. Suitable for sealing around conductors/cables to be installed.

4. Products:

   a. American Polywater Corporation; PHRD SG Mechanical Seals: www.polywater-haufftechnik.com/#sle.

   b. Substitutions: See Section 01 60 00 - Product Requirements.

G. Sealing Systems for Concrete Penetrations:

1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.

2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

3. Products:

   a. American Polywater Corporation; PZVR Cement-Coated Concrete Wall Sleeves: www.polywater-haufftechnik.com/#sle.

b. American Polywater Corporation; PHSD Mechanical Seals: www.polywater-haufftechnik.com/#sle.

c. American Polywater Corporation; PHSI 150 Varia Double Wall Inserts: www.polywater-haufftechnik.com/#sle.

d. American Polywater Corporation; PGKD Modular Seals: www.polywater-haufftechnik.com/#sle.

e. Substitutions: See Section 01 60 00 - Product Requirements.

H. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

1. Products:

a. Alta Products, LLC; Sigrist Pipe Chase Housing, Curbs, and Exit Seals: www.altaproductsllc.com/#sle.

b. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.

c. Menzies Metal Products; Electrical Retro Box: www.menzies-metal.com/#sle.

d. Substitutions: See Section 01 60 00 - Product Requirements.

I. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

1. Products:

a. Quickflash Weatherproofing Products, Inc: www.quickflashproducts.com/#sle.

b. Substitutions: See Section 01 60 00 - Product Requirements.

J. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for conduit/duct arrangement to be installed.

1. Products:

a. Advance Products & Systems, LLC; Duct Bank Spacers: www.apsonline.com/#sle.

b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

F. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.

G. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.

2. When conduit destination is indicated without specific routing, determine exact routing required.

3. Conceal conduits unless specifically indicated to be exposed.

4. Conduits in the following areas may be exposed, unless otherwise indicated:

a. Electrical rooms.

b. Mechanical equipment rooms.

c. Within joists in areas with no ceiling.

d. Within water treatment facility where no ceiling is installed.

5. Unless otherwise approved, do not route exposed conduits:
    a. Across floors.
    b. Across roofs.
    c. Across top of parapet walls.
    d. Across building exterior surfaces.
6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.
14. Group parallel conduits in same area on common rack.

H. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 05 29.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

4. Use conduit strap to support single surface-mounted conduit.

   a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.

5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.

6. Use conduit clamp to support single conduit from beam clamp or threaded rod.

7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.

8. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.

9. Use of spring steel conduit clips for support of conduits is not permitted.

10. Use of wire for support of conduits is not permitted.

11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.

I. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.

2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

3. Use suitable adapters where required to transition from one type of conduit to another.

4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.

5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.

6. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.

7. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.

8. Secure joints and connections to provide mechanical strength and electrical continuity.

J. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.

2. Make penetrations perpendicular to surfaces unless otherwise indicated.

3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.

4. Conceal bends for conduit risers emerging above ground.

5. Provide suitable sealing system where conduits penetrate exterior wall below grade.

6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.

8. Provide metal escutcheon plates for conduit penetrations exposed to public view.

K. Underground Installation:

1. Minimum Cover, Unless Otherwise Indicated or Required:

a. Underground, Exterior: 24 inches.

b. Under Slab on Grade: 12 inches to bottom of slab.

2. Provide underground warning tape along entire conduit length for all underground conduit; see Section 26 05 53.

L. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):

1. Maximum Conduit Size: 1-inch trade size unless otherwise approved.

2. Install conduits within middle one third of slab thickness.

3. Secure conduits to prevent floating or movement during pouring of concrete.

M. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches on all sides unless otherwise indicated; see Section 03 30 00.

N. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:

1. Where conduits cross structural joints intended for expansion, contraction, or deflection.

2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.

3. Where conduits are subject to earth movement by settlement or frost.

O. Conduit Sealing:

1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:

a. Where conduits enter building from outside.

b. Where service conduits enter building from underground distribution system.

c. Where conduits enter building from underground.

d. Where conduits may transport moisture to contact live parts.

2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:

   a. Where conduits pass from outdoors into conditioned interior spaces.

   b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

P. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

Q. Provide grounding and bonding; see Section 26 05 26.

R. Identify conduits; see Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective conduits.

3.4 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.5 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION 26 05 33.13

DIVISION 26 - ELECTRICAL
SECTION 26 05 33.16 - BOXES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Floor boxes.

D. Underground boxes/enclosures.

E. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

D. Section 26 05 29 - Hangers and Supports for Electrical Systems.

E. Section 26 05 33.13 - Conduit for Electrical Systems:

F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 27 26 - Wiring Devices:

H. Section 26 28 13 - Fuses: Spare fuse cabinets.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

F. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013 (Reaffirmed 2020).

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

L. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.

4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.

5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.

6. Coordinate the work with other trades to preserve insulation integrity.

7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.

8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures and floor boxes.

C. Samples:

1. Floor Boxes: Provide one sample(s) of each floor box proposed for substitution upon request.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, and floor boxes.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Keys for Lockable Enclosures: Six of each different key.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.

2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.

3. Provide products listed, classified, and labeled as suitable for the purpose intended.

4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.

3. Use cast iron boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.

4. Use nonmetallic boxes where exposed rigid PVC conduit is used. In damp or wet locations furnish with compatible weatherproof gasketed covers.

5. Use suitable concrete type boxes where flush-mounted in concrete.

6. Use suitable masonry type boxes where flush-mounted in masonry walls.

7. Use raised covers suitable for the type of wall construction and device configuration where required.

8. Use shallow boxes where required by the type of wall construction.

9. Do not use "through-wall" boxes designed for access from both sides of wall.

10. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

11. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.

12. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.

13. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.

14. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.

15. Minimum Box Size, Unless Otherwise Indicated:

    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.

    b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.

    c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.

16. Wall Plates: Comply with Section 26 27 26.

17. Manufacturers:

    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.

    b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com.

    c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com.

    d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.

e. Thomas & Betts Corporation: www.tnb.com.

f. Substitutions: See Section 01 60 00 - Product Requirements.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:

1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.

2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:

a. Indoor Clean, Dry Locations: Type 1, painted steel.

b. Indoor Damp or Wet Locations: Type 3R, painted steel.

c. Outdoor Locations: Type 3R, painted steel.

3. Junction and Pull Boxes Larger Than 100 cubic inches:

a. Provide hinged-cover enclosures unless otherwise indicated.

b. Boxes 6 square feet and Larger: Provide hinged-cover enclosures.

4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:

a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.

b. Back Panels: Painted steel, removable.

5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

6. Manufacturers:

a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.

b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com.

c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com.

d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Floor Boxes:

1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 27 26; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.

2. Use cast iron floor boxes within slab on grade.

3. Use sheet-steel or cast iron floor boxes within slab above grade.

4. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).

5. Manufacturer: Same as manufacturer of floor box service fittings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Boxes mounted in a stud space shall be mounted with a support bracket that spans the distance between the stud space and is secured to both studs.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide separate boxes for emergency power and normal power systems.

F. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

G. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

H. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

I. Box Locations:

1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.

2. Unless dimensioned, box locations indicated are approximate.

3. Locate boxes as required for devices installed under other sections or by others.

   a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.

4. Locate boxes so that wall plates do not span different building finishes.

5. Locate boxes so that wall plates do not cross masonry joints.

6. Install flush-mounted boxes on opposite sides of walls in different stud spaces, boxes shall not be installed back to back.

7. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.

8. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Install in sperate stud cavities, if not possible, provide minimum 6 inches horizontal separation unless otherwise indicated.

9. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.

10. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.

    a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.

    b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.

11. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.

12. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:

    a. Concealed above accessible suspended ceilings.

    b. Within joists in areas with no ceiling.

    c. Electrical rooms.

    d. Mechanical equipment rooms.

J. Box Supports:

1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.

4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

K. Install boxes plumb and level.

L. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.

2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

M. Floor-Mounted Cabinets: Mount on properly sized nominal 4 inch high concrete pad constructed in accordance with Section 03 30 00.

N. Install boxes as required to preserve insulation integrity.

O. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

P. Underground Boxes/Enclosures:

1. Install enclosure on gravel base, minimum 6 inches deep.

2. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

Q. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

R. Close unused box openings.

S. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

T. Provide grounding and bonding in accordance with Section 26 05 26.

U. Identify boxes in accordance with Section 26 05 53.

3.3 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.4 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION 26 05 33.16

DIVISION 26 - ELECTRICAL
SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Floor marking tape.

G. Warning signs and labels.

1.2 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting.

B. Section 09 91 23 - Interior Painting.

C. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

D. Section 26 05 73 - Power System Studies: Arc flash hazard warning labels.

E. Section 262200 - Low Voltage Transformers: Identification nameplate and warning lables.

F. Section 262816.16 - Enclosed Switches.

G. Section 262913 - Enclosed Controllers.

H. Section 262923 - Variable Frequency Motor Controllers.

I. Section 263213 - Engine Generators.

J. Section 263600 - Transfer Switches

K. Section 27 10 00 - Structured Cabling: Identification for communications cabling and devices.

1.3 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011 (Reaffirmed 2017).

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.

2. Do not install identification products until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.7 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.

a. Switchboards:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify power source and circuit number. Include location when not within sight of equipment.

4) Use identification nameplate to identify main overcurrent protective device.

5) Use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.

b. Panelboards:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify power source and circuit number. Include location.

4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.

5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.

6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

c. Transformers:

1) Identify kVA rating.

2) Identify voltage and phase for primary and secondary.

3) Identify power source and circuit number. Include location when not within sight of equipment.

4) Identify load(s) served. Include location.

d. Enclosed switches, circuit breakers, motor controllers, and motor drives:

1) Identify voltage and phase.

2) Identify power source and circuit number. Include location when not within sight of equipment.

3) Identify load(s) served. Include location when not within sight of equipment.

e. Enclosed Contactors:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).

4) Identify coil voltage.

5) Identify load(s) and associated circuits controlled. Include location.

f. Transfer Switches:

1) Identify voltage and phase.

2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.

3) Identify load(s) served. Include location when not within sight of equipment.

4) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.

2. Service Equipment:

   a. Use identification nameplate to identify each service disconnecting means.

3. Emergency System Equipment:

   a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.

   b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.

4. Use voltage marker to identify highest voltage present for each piece of electrical equipment.

5. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.

6. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.

7. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.

8. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.

9. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.

   a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Section 09 91 23 and 09 91 13.

10. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.

a. Service equipment.

b. Transfer switches.

c. Switchboards.

d. Panelboards.

11. Arc Flash Hazard Warning Labels: Comply with Section 26 05 73.

12. Use warning signs to identify electrical hazards with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.

B. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.

2. Identification for Communications Conductors and Cables: Comply with Section 27 10 00.

3. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

4. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:

a. At each source and load connection.

b. Within boxes when more than one circuit is present.

c. Within equipment enclosures when conductors and cables enter or leave the enclosure.

5. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.

C. Identification for Raceways:

1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.

2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.

    a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.

        1) Field-Painting: Comply with Section 09 91 23 and 09 91 13.

        2) Vinyl Color Coding Electrical Tape: Comply with Section 26 05 19.

3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.

4. Use underground warning tape to identify underground raceways.

D. Identification for Devices:

1. Identification for Communications Devices: Comply with Section 27 10 00.

2. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.

3. Use engraved wallplate to identify serving branch circuit for all receptacles.

4. Use engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.

5. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Manufacturers:

    a. Brimar Industries, Inc: www.brimar.com.

    b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.

    c. Seton Identification Products: www.seton.com.

    d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Materials:

a. Indoor Clean, Dry Locations: Use plastic nameplates.

b. Outdoor Locations: Use stainless steel or aluminum nameplates suitable for exterior use.

3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.

a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.

4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.

5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.

6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Manufacturers:

a. Brady Corporation: www.bradyid.com.

b. Brother International Corporation: www.brother-usa.com.

c. Panduit Corp: www.panduit.com.

d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.

a. Use only for indoor locations.

3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch by 2.5 inches.

2. Legend:

a. System designation where applicable:

1) Emergency Power System: Identify with text "EMERGENCY".

b. Equipment designation or other approved description.

c. Other information as indicated.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height:

a. System Designation: 1 inch.

b. Equipment Designation: 1/2 inch.

c. Other Information: 1/4 inch.

d. Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.

5. Color:

a. Normal Power System:

1) 480Y/277 V, 3 Phase Equipment: Black text on yellow background.

2) 208Y/120 V, 3 Phase Equipment: Black text on white background.

3) Electrical Equipment: Black text on white background.

b. Emergency Power System: White text on red background.

D. Format for General Information and Operating Instructions:

1. Minimum Size: 1 inch by 2.5 inches.

2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 1/4 inch.

5. Color: Black text on white background unless otherwise indicated.

E. Format for Caution and Warning Messages:

1. Minimum Size: 2 inches by 4 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/2 inch.
5. Color: Black text on yellow background unless otherwise indicated.

F. Format for Receptacle Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Power source and circuit number or other designation indicated.
    a. Include voltage and phase for other than 120 V, single phase circuits.
3. Text: All capitalized unless otherwise indicated, engraved.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

G. Format for Control Device Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Load controlled or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

H. Format for Fire Alarm Device Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Designation indicated and device zone or address.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Red text on white background.

2.3 WIRE AND CABLE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradyid.com.
2. HellermannTyton: www.hellermanntyton.com.
3. Panduit Corp: www.panduit.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

1. Do not use handwritten text.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

2.4 VOLTAGE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradyid.com.
2. Brimar Industries, Inc: www.brimar.com.
3. Seton Identification Products: www.seton.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl type markers.

1. EES conduits in Healthcare facilites shall have markers installed on raceways per NEC.

C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

D. Minimum Size:

1. Markers for Equipment: 1 1/8 by 4 1/2 inches.

2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.

3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.

4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

E. Legend:

1. Markers for Voltage Identification: Highest voltage present.

2. Markers for System Identification:

a. Emergency Power System: Text "EMERGENCY".

b. Other Systems: Type of service.

F. Color: Black text on orange background unless otherwise indicated.

2.5 UNDERGROUND WARNING TAPE

A. Manufacturers:

1. Brady Corporation: www.bradyid.com.

2. Brimar Industries, Inc: www.brimar.com.

3. Seton Identification Products: www.seton.com.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

C. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

D. Legend: Type of service, continuously repeated over full length of tape.

E. Color:

1. Tape for Buried Power Lines: Black text on red background.

2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.6 FLOOR MARKING TAPE

A. Manufacturers:

1. Brady Corporation: www.bradyid.com.

2. Brimar Industries, Inc: www.brimar.com/#sle.

3. Seton Identification Products: www.seton.com.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches wide, with alternating black and white stripes.

2.7 WARNING SIGNS AND LABELS

A. Manufacturers:

1. Brimar Industries, Inc: www.brimar.com.

2. Clarion Safety Systems, LLC: www.clarionsafety.com.

3. Seton Identification Products: www.seton.com.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

C. Warning Signs:

1. Materials:

a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.

b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.

2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.

3. Minimum Size: 7 by 10 inches unless otherwise indicated.

D. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.

a. Do not use labels designed to be completed using handwritten text.

2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.

3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:

1. Surface-Mounted Equipment: Enclosure front.

2. Flush-Mounted Equipment: Inside of equipment door.

3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.

4. Elevated Equipment: Legible from the floor or working platform.

5. Branch Devices: Adjacent to device.

6. Interior Components: Legible from the point of access.

7. Conduits: Legible from the floor.

8. Boxes: Outside face of cover.

9. Conductors and Cables: Legible from the point of access.

10. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing.

1. Do not use adhesives on exterior surfaces except where substrate cannot be penetrated.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 26 05 53

DIVISION 26 - ELECTRICAL
SECTION 26 05 73 - POWER SYSTEM STUDIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Short-circuit study.

B. Protective device coordination study.

C. Arc flash and shock risk assessment.

1. Includes arc flash hazard warning labels.

D. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

1.2 RELATED REQUIREMENTS

A. Section 26 05 53 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

B. Section 26 21 00 - Low-Voltage Electrical Service Entrance.

1. Includes Utility Company contact information.

C. Section 26 24 13 - Switchboards.

D. Section 26 24 16 - Panelboards.

E. Section 26 28 13 - Fuses.

F. Section 26 28 16.13 - Enclosed Circuit Breakers.

G. Section 26 28 16.16 - Enclosed Switches.

H. Section 26 29 13 - Enclosed Controllers.

1.3 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).

B. IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).

C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).

D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.

E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.

F. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).

G. NEMA MG 00001 - Motors and Generators; 2024.

H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.

2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

3. Shop drawings for equipment provided in Related Requirements listed above will not be reviewed for compliance until the power studies defined in this section have been reviewed and approved.

B. Pre-Study Meeting: Conduct meeting with Owner to discuss system operating modes and conditions to be considered in studies.

C. Sequencing:

1. Submit study reports prior to or concurrent with product submittals.

2. Do not order equipment until matching study reports and product submittals have both been evaluated by Architect.

3. Verify naming convention for equipment identification prior to creation of final drawings, reports, and arc flash hazard warning labels (where applicable).

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Study preparer's qualifications, Licensed Professional Engineer in the State of the proejct.

C. Field testing agency's qualifications.

D. Study reports, stamped or sealed and signed by study preparer.

E. Product Data: In addition to submittal requirements specified in other sections, include manufacturer's standard catalog pages and data sheets for equipment and protective devices indicating information relevant to studies.

1. Include characteristic time-current trip curves for protective devices.

2. Include impedance data for engine generators.

3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.

4. Identify modifications made in accordance with studies that:

a. Can be made at no additional cost to Owner.

b. As submitted will involve a change to the contract sum.

F. Arc Flash Hazard Warning Label Samples: One of each type and legend specified.

G. Site-specific arc flash hazard warning labels.

H. Field quality control reports.

I. Certification that field adjustable protective devices have been set in accordance with requirements of studies.

J. Project Record Documents: Revise studies as required to reflect as-built conditions.

1. Include hard copies with operation and maintenance data submittals.

2. Include computer software files used to prepare studies with file name(s) cross-referenced to specific pieces of equipment and systems.

1.6 POWER SYSTEM STUDIES

A. Scope of Studies:

1. Perform analysis of proposed electrical distribution system as indicated on drawings.

2. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).

3. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.

a. Known Operating Modes:

1) Utility as source.

2) Generator as source.

B. General Study Requirements:

1. Comply with NFPA 70.

2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:

1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.

a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.

1) Obtain up-to-date information from Utility Company.

2) Utility Company: As indicated on drawings.

b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.

c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 00001 code letter designation.

d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.

e. Protective Devices:

1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).

2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).

f. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.

g. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

D. Short-Circuit Study:

1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.

2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:

a. Maximum utility fault currents.

b. Maximum motor contribution.

c. Known operating modes (e.g. utility as source, generator as source).

3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

E. Protective Device Coordination Study:

1. Comply with applicable portions of IEEE 242 and IEEE 399.

2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source).

3. Analyze protective devices and associated settings for suitable margins between time-current curves to provide adequate protection for equipment and conductors while achieving best possible coordination.

F. Arc Flash and Shock Risk Assessment:

1. Comply with NFPA 70E.

2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.

a. Where reasonable, study preparer may assume a maximum clearing time of two seconds in accordance with IEEE 1584, provided that the conditions are such that a worker's egress from an arc flash event would not be inhibited.

3. For equipment with main devices mounted in separate compartmentalized sections, perform calculations on both the line and load side of the main device.

4. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:

a. Maximum and minimum utility fault currents.

b. Maximum and minimum motor contribution.

c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

G. Study Reports:

1. General Requirements:

a. Identify date of study and study preparer.

b. Identify study methodology and software product(s) used.

c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.

d. Identify base used for per unit values.

e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.

f. Include conclusions and recommendations.

2. Short-Circuit Study:

a. For each scenario, identify at each bus location:

1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).

2) Fault point X/R ratio.

3) Associated equipment short circuit current ratings.

b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.

3. Protective Device Coordination Study:

a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.

b. For each graph include (where applicable):

1) Partial single-line diagram identifying the portion of the system illustrated.

2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.

3) Conductors: Damage curves.

4) Transformers: Inrush points and damage curves.

5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.

6) Motors: Full load current, starting curves, and damage curves.

7) Capacitors: Full load current and damage curves.

c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.

1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.

2) Include ground fault pickup and delay.

3) Include fuse ratings.

4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.

d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.

4. Arc Flash and Shock Risk Assessment:

a. For the worst case for each scenario, identify at each bus location:

1) Calculated incident energy and associated working distance.

2) Calculated arc flash boundary.

3) Bolted fault current.

4) Arcing fault current.

5) Clearing time.

6) Arc gap distance.

b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.

c. Include recommendations for reducing the incident energy at locations where the calculated maximum incident energy exceeds 8 calories per sq cm.

1.7 QUALITY ASSURANCE

A. Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in preparation of studies of similar type and complexity using specified computer software.

1. Study preparer may be employed by manufacturer of electrical distribution equipment.

2. Study preparer may be employed by field testing agency.

B. Field Testing Agency Qualifications: Independent testing organization specializing in testing, analysis, and maintenance of electrical systems with minimum five years experience; NETA Accredited Company.

1. Field Supervisor: Certified electrical testing technician; NETA ETT Level III.

C. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.

1. Products:

a. EasyPower LLC: www.easypower.com.

b. ETAP/Operation Technology, Inc: www.etap.com.

c. SKM Systems Analysis, Inc: www.skm.com.

d. Substitutions: Not permitted.

PART 2 PRODUCTS

2.1 ARC FLASH HAZARD WARNING LABELS

A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.

1. Materials: Comply with Section 26 05 53.

2. Minimum Size: 4 by 6 inches.

3. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.

a. Include orange header that reads "WARNING" unless otherwise indicated.

b. Include the text "Arc Flash and Shock Hazard; Appropriate PPE Required" or approved equivalent.

c. Include the following information:

1) Arc flash boundary.

2) Available incident energy and corresponding working distance.

3) Site-specific PPE (personnel protective equipment) requirements.

4) Nominal system voltage.

5) Limited approach boundary.

6) Restricted approach boundary.

7) Equipment identification.

8) Study preparer, report reference, and date calculations were performed.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install arc flash warning labels in accordance with Section 26 05 53.

3.2 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Provide the services of field testing agency or equipment manufacturer's representative to perform inspection, testing, and adjusting.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Adjust equipment and protective devices for compliance with studies and recommended settings.

E. Notify Architect of any conflicts with or deviations from studies. Obtain direction before proceeding.

F. Submit detailed reports indicating inspection and testing results, and final adjusted settings.

3.3 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Training: Include as part of the base bid training for Owner's personnel on electrical safety pertaining to arc flash and shock hazards.

1. Use site-specific arc flash and shock risk assessment report as training reference, supplemented with additional training materials as required.

2. Provide minimum of eight hours of training.

3. Instructor: Representative of entity performing study.

4. Location: At project site.

END OF SECTION 26 05 73

DIVISION 26 - ELECTRICAL
SECTION 26 05 83 - WIRING CONNECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 26 05 33.13 - Conduit for Electrical Systems.

C. Section 26 05 33.16 - BOXES.

D. Section 26 27 26 - Wiring Devices.

E. Section 26 28 16.16 - Enclosed Switches.

F. Section 26 29 13 - Enclosed Controllers.

1.3 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

2. Determine connection locations and requirements.

B. Sequencing:

1. Install rough-in of electrical connections before installation of equipment is required.

2. Make electrical connections before required start-up of equipment.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide wiring device manufacturer’s catalog information showing dimensions, configurations, and construction.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.

1. Colors: Comply with NEMA WD 1.

2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.

3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 26 28 16.16 and in individual equipment sections.

C. Wiring Devices: As specified in Section 26 27 26.

D. Flexible Conduit: As specified in Section 26 05 33.13.

E. Wire and Cable: As specified in Section 26 05 19.

F. Boxes: As specified in Section 26 05 33.16.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION 26 05 83

DIVISION 26 - ELECTRICAL
SECTION 26 09 16 - ELECTRIC CONTROLS AND RELAYS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pushbutton and selector switches.

B. Control stations and panels.

C. Relays and time-delay relays.

D. Control power transformers.

1.2 RELATED REQUIREMENTS

A. Section 26 05 33.16 - BOXES: Cabinets and terminal blocks.

1.3 REFERENCE STANDARDS

A. NEMA ICS 1 - Industrial Control and Systems General Requirements; 2022.

B. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

C. NEMA IA 10030 - Industrial Control and Systems: Enclosures; 2024.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Submit to NEMA ICS 1 indicating control panel layouts, wiring connections and diagrams, dimensions, support points.

C. Product Data: Provide for each component showing electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ABB/GE: www.geindustrial.com.

B. Eaton Corporation: www.eaton.com.

C. Rockwell Automation; _____: www.rockwellautomation.com/#sle.

D. Schneider Electric; Square D Products: www.schneider-electric.us.

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 COMPONENTS

A. Control Switches and Stations:

1. Contacts: NEMA ICS 2, Form Z.

2. Contact Ratings: NEMA ICS 2, A150.

3. Selector Switch Operators: Three position rotary selector switch.

4. Control Stations: Heavy duty oiltight type pushbutton station.

B. Magnetic Control Relays: NEMA ICS 2, Class A300.

1. Contacts: NEMA ICS 2, Form Z.

2. Contact Ratings: NEMA ICS 2, Class A150.

C. Solid-State Relays: NEMA ICS 2.

1. Contacts: NEMA ICS 2, Form Z.

2. Contact Ratings: NEMA ICS 2, Class A150.

3. Coil Voltage: 120 volts, 60 Hz, AC.

D. Time-Delay Relays: NEMA ICS 2, Class A600, solid-state time-delay relay with application required time delay after energization.

1. Contacts: NEMA ICS 2, Form Z.

2. Contact Ratings: NEMA ICS 2, Class A150.

3. Coil Voltage: 120 volts, 60 Hz, AC.

E. Interval Timing Relays: NEMA ICS 2, Class A300, repeat cycle timer.

1. Contacts: NEMA ICS 2, Form Z.

2. Contact Ratings: NEMA ICS 2, Class A150.

3. Coil Voltage: 120 volts, 60 Hz, AC.

F. Clock Timers: NEMA ICS 2, Class A300, 24 hour timer.

1. Contacts: NEMA ICS 2, Form Z.

2. Contact Ratings: NEMA ICS 2, Class A150.

3. Coil Voltage: 120 volts, 60 Hz, AC.

G. Control Power Transformers: Machine tool transformer with isolated secondary winding.

1. Power Rating: As required by application.

2. Voltage Rating: 480 volts primary; 120 volts secondary.

3. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 ENCLOSURES

A. Control Station Enclosures: NEMA IA 10030; Type 12.

B. Relay Enclosures: NEMA IA 10030; Type 12.

C. Fabrication: Shop fabricate control panels to NEMA ICS 1, using cabinets and terminal blocks furnished in accordance with Section 26 05 33.16.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install individual relays and time-delay relays in enclosures.

C. Install cabinets in accordance with Section 26 05 33.16.

D. Make electrical wiring interconnections as indicated.

END OF SECTION 26 09 16

DIVISION 26 - ELECTRICAL
SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Occupancy sensors.

B. Outdoor photo controls.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems

C. Section 26 05 33.16 - BOXES.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 05 73 - Power System Studies.

F. Section 26 09 18 - Remote Control Switching Devices: Remotely controlled devices for lighting control, including networked lighting controls, programmable relay panels, and remote control switching relays.

G. Section 26 27 26 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

1. Includes finish requirements for wall controls specified in this section.

2. Includes accessory receptacles, switches, dimmers and wall plates, to match lighting controls specified in this section.

H. Section 26 28 13 - Fuses.

I. Section 26 29 13 - Enclosed Controllers : General purpose contactors.

J. Section 26 51 00 - Interior Lighting.

K. Section 26 56 00 - Exterior Lighting.

1.3 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2023.

C. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols; 2020.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

F. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2020.

G. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 773 - Plug-in, Locking Type Photocontrols for Use with Area Lighting; Current Edition, Including All Revisions.

J. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.

K. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.

L. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.

3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.

4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install lighting control devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:

1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

D. Samples (if requested):

1. Occupancy Sensors: One for each type and color specified.

E. Field Quality Control Reports.

F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data: Include detailed information on device programming and setup.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Locking Receptacle-Mounted Outdoor Photo Controls: Five percent of total quantity installed for each type, but not less than two of each type.

I. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all occupancy sensors.

C. Provide five year manufacturer warranty for utility grade locking receptacle-mounted outdoor photo controls.

PART 2 PRODUCTS

2.1 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

C. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.2 OCCUPANCY SENSORS

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com.
2. Lutron Electronics Company, Inc: www.lutron.com.
3. Acuity Controls: www.Acuitybrands.com
4. Eaton (Cooper) Controls: www.Cooperindustries.com/content/public/en/lighting_lighting.html
5. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
   a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.

8. Sensitivity: Field adjustable.

9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.

10. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

11. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.

12. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.

13. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.

14. Wireless Sensors:

    a. RF Range: 30 feet through typical construction materials.

    b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.

    c. Power: Battery-operated with minimum ten-year battery life.

C. Wall Switch Occupancy Sensors:

1. All Wall Switch Occupancy Sensors:

    a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.

    b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.

c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.

d. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.

f. Provide selectable audible alert to notify occupant of impending load turn-off.

g. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.

h. Provide vandal resistant lenses for passive infrared (PIR) and dual technology wall switch occupancy sensors where indicated.

2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

D. Wall Dimmer Occupancy Sensors:

1. General Requirements:

a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.

b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.

d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.

e. Provide field adjustable dimming preset for occupied state.

f. Provide fade-to-off operation to notify occupant of impending load turn-off.

g. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.

2. Passive Infrared (PIR) Wall Dimmer Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

E. Ceiling Mounted Occupancy Sensors:

1. All Ceiling Mounted Occupancy Sensors:

a. Description: Low profile occupancy sensors designed for ceiling installation.

b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.

c. Provide field selectable setting for disabling LED motion detector visual indicator.

d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.

e. Finish: White unless otherwise indicated.

2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

F. Power Packs for Low Voltage Occupancy Sensors:

1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.

2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.

3. Input Supply Voltage: Dual rated for 120/277 V ac.

4. Load Rating: As required to control the load indicated on drawings.

G. Accessories:

1. Provide heavy duty coated steel wire protective guards compatible with specified occupancy sensorsfor occupancy sensors located in Gymnasiums and other locations as indicated on drawings..

2.3 OUTDOOR PHOTO CONTROLS

A. Manufacturers:

1. Intermatic, Inc: www.intermatic.com.

2. Tork, a division of NSI Industries LLC: www.tork.com.

3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Locking Receptacle-Mounted Outdoor Photo Controls

1. Description: Plug-in locking type photo control unit complying with ANSI C136.10 for mounting on a compatible receptacle, listed and labeled as complying with UL 773.

2. Housing: Weatherproof, impact resistant UV stabilized polypropylene, color to be selected.

3. Photo Sensor: Cadmium sulfide.

4. Light Level Activation: 1 to 3 footcandles turn-on and 1.5 to 1 turn-off to turn-on ratio with instant turn-on and delayed turn-off.

5. Voltage: As required to control the load indicated on the drawings.

6. Failure Mode: Fails to the on position.

7. Load Rating: As required to control the load indicated on the drawings.

8. Surge Protection: 160 joule metal oxide varistor.

C. Button Type Outdoor Photo Controls

1. Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.
2. Housing: Weather resistant polycarbonate.
3. Photo Sensor: Cadmium sulfide.
4. Light Level Activation: 1 to 3 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
5. Voltage: As required to control the load indicated on the drawings.
6. Failure Mode: Fails to the on position.
7. Load Rating: As required to control the load indicated on the drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of lighting control devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:

a. Wall Switch Occupancy Sensors: 48 inches above finished floor.

2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.

3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.

G. Provide required supports in accordance with Section 26 05 29.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Identify lighting control devices in accordance with Section 26 05 53.

J. Occupancy Sensor Locations:

1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations

as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.

2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

K. Outdoor Photo Control Locations:

1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.

2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

M. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

N. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

O. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

P. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test outdoor photo controls to verify proper operation, including time delays where applicable.

E. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

D. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours of training.

3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.

4. Location: At project site.

END OF SECTION 26 09 23

DIVISION 26 - ELECTRICAL
SECTION 26 21 00 - LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical service requirements.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for cast-in-place concrete equipment pads.

B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

D. Section 26 05 29 - Hangers and Supports for Electrical Systems.

E. Section 26 05 33.13 - Conduit for Electrical Systems.

F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 36 00 - Transfer Switches: Service entrance equipment.

H. Section 26 43 00 - Surge Protective Devices: Service entrance surge protective devices.

I. Section 31 23 16 - Excavation.

J. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

K. Section 31 23 23 - Fill: Bedding and backfilling.

1.3 PRICE AND PAYMENT PROCEDURES

A. Allowances:

1. See Section 01 21 00 - Allowances, for allowances affecting this section.

2. Include cash allowance for Utility Company charges associated with providing service.

1.4 DEFINITIONS

A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

1.5 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.6 ADMINISTRATIVE REQUIREMENTS

A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.

B. Coordination:

1. Verify the following with Utility Company representative:

a. Utility Company requirements, including division of responsibility.

b. Exact location and details of utility point of connection.

c. Utility easement requirements.

d. Utility Company charges associated with providing service.

2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.

3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.

D. Utility Company charges associated with providing permanent service to be paid by Contractor..

E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.

F. Scheduling:

1. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.7 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Utility Company letter of availability for providing electrical service to project.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.

D. Shop Drawings: Include dimensioned plan views and sections indicating locations and arrangement of Utility Company and service entrance equipment, metering provisions, required clearances, and proposed service routing.

E. Drawings prepared by Utility Company.

1.8 QUALITY ASSURANCE

A. Comply with the following:

1. IEEE C2 (National Electrical Safety Code).

2. NFPA 70 (National Electrical Code).

3. The requirements of the Utility Company.

4. The requirements of the local authorities having jurisdiction.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 ELECTRICAL SERVICE REQUIREMENTS

A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B. Electrical Service Characteristics: As indicated on drawings.

C. Utility Company: As indicated on drawings.

D. Division of Responsibility:

1. Pad-Mounted Utility Transformers:

a. Transformer Vaults and Pads: Furnished and installed by Contractor per Utility Company requirements.

b. Transformers: Furnished and installed by Utility Company.

c. Transformer Grounding Provisions: Furnished and installed by Contractor per Utility Company requirements.

d. Primary:

1) Trenching and Backfilling: Provided by Contractor.

2) Conduits: Furnished and installed by Contractor.

3) Conductors: Furnished and installed by Utility Company.

e. Secondary:

1) Trenching and Backfilling: Provided by Contractor.

2) Conduits: Furnished and installed by Contractor.

3) Conductors: Furnished and installed by Contractor (Service Point at transformer).

2. Terminations at Service Point: Provided by Utility Company.

3. Metering Provisions:

a. Meter Bases: Furnished and installed by Contractor per Utility Company requirements.

b. Metering Transformer Cabinets: Furnished and installed by Contractor per Utility Company requirements.

c. Metering Transformers: Furnished and installed by Utility Company.

d. Conduits Between Metering Transformers and Meters: Furnished and installed by Contractor per Utility Company requirements.

e. Wiring Between Metering Transformers and Meters: Furnished and installed by Utility Company.

f. Communications Conduits for Meters: Furnished and installed by Contractor per Utility Company requirements.

E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Verify and mark locations of existing underground utilities.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions and Utility Company requirements.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required trenching and backfilling in accordance with Section 31 23 16 and Section 31 23 23.

E. Construct cast-in-place concrete pads for utility equipment in accordance with Utility Company requirements and Section 03 30 00.

F. Provide required support and attachment components in accordance with Section 26 05 29.

G. Provide grounding and bonding for service entrance equipment in accordance with Section 26 05 26.

H. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26 05 53.

3.4 PROTECTION

A. Protect installed equipment from subsequent construction operations.

END OF SECTION 26 21 00

DIVISION 26 - ELECTRICAL
SECTION 26 22 00 - LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General purpose transformers.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 33.13 - Conduit for Electrical Systems: Flexible conduit connections.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 09 16 - Electric Controls and Relays: Industrial control transformers.

G. Section 26 24 16 - Panelboards.

1.3 REFERENCE STANDARDS

A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.

B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.

C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.

F. NEMA ST 20 - Dry Type Transformers for General Applications; 2021.

G. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.

K. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with placement of supports, anchors, etc. required for mounting.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.

C. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.

D. Source Quality Control Test Reports: Include reports for tests designated in NEMA ST 20 as design and routine tests.

E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Maintenance Data: Include recommended maintenance procedures and intervals.

H. Project Record Documents: Record actual locations of transformers.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.

1. Greater than 10 kVA: 104 degrees F maximum.

2. Less than 10 kVA: 77 degrees F maximum.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ABB/GE: www.geindustrial.com.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Substitutions: See Section 01 60 00 - Product Requirements.

F. Source Limitations: Provide transformers produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.2 TRANSFORMERS - GENERAL REQUIREMENTS

A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.

B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:

1. Altitude: Less than 3,300 feet.

2. Ambient Temperature:

a. Greater than 10 kVA: Not exceeding 104 degrees F.

b. Less than 10 kVA: Not exceeding 77 degrees F.

C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.

E. Basic Impulse Level: 10 kV.

F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

G. Isolate core and coil from enclosure using vibration-absorbing mounts.

H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.3 GENERAL PURPOSE TRANSFORMERS

A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.

B. Primary Voltage: 480 volts delta, 3 phase.

C. Secondary Voltage: 208Y/120 volts, 3 phase.

D. Insulation System and Allowable Average Winding Temperature Rise:

1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.

2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.

E. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.

F. Winding Taps:

1. Less than 3 kVA: None.

2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.

3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.

4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.

G. Energy Efficiency: Comply with 10 CFR 431, Subpart K.

H. Sound Levels: Standard sound levels complying with NEMA ST 20

I. Mounting Provisions:

1. Less than 15 kVA: Suitable for wall mounting.
2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
3. Larger than 75 kVA: Suitable for floor mounting.

J. Transformer Enclosure: Comply with NEMA ST 20.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor clean, dry locations: Type 2.
   b. Outdoor locations: Type 3R.
2. Construction: Steel.
   a. Less than 15 kVA: Totally enclosed, non-ventilated.
   b. 15 kVA and Larger: Ventilated.
3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
4. Provide lifting eyes or brackets.

K. Accessories:

1. Mounting Brackets: Provide manufacturer's standard brackets.
2. Weathershield Kits: Provide for ventilated transformers installed outdoors to provide a listed NEMA EN 10250, type 3R assembly.
3. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

2.4 SOURCE QUALITY CONTROL

A. Factory test transformers according to NEMA ST 20.

B. Sound Level Tests: Perform factory test designated in NEMA ST 20 as "design" test on each production unit.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.

C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install transformers in accordance with NECA 409 and IEEE C57.94.

D. Use flexible conduit, under the provisions of Section 26 05 33.13, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.

F. Install transformers plumb and level.

G. Transformer Support:

1. Provide required support and attachment in accordance with Section 26 05 29, where not furnished by transformer manufacturer.

2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.

3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.

4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

H. Provide grounding and bonding in accordance with Section 26 05 26.

I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.

J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

K. Where furnished as a separate accessory, install transformer weathershield per manufacturer's instructions.

L. Identify transformers in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS Sections 7.2.1.1 and 7.2.1.2. Tests and inspections listed as optional are not required, except for the following:

1. 167 kVA single phase, 500 kVA three phase and smaller:

a. Perform turns ratio tests at all tap positions.

3.4 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from transformer components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 22 00

DIVISION 26 - ELECTRICAL
SECTION 26 24 13 - SWITCHBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.

B. Overcurrent protective devices for switchboards.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

F. Section 26 27 13 - Electricity Metering: For interface with equipment specified in this section.

G. Section 26 43 00 - Surge Protective Devices.

1.3 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendment (2017).

B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.

E. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

F. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

G. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.

H. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less; 2013.

I. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

N. UL 891 - Switchboards; Current Edition, Including All Revisions.

O. UL 977 - Fused Power-Circuit Devices; Current Edition, Including All Revisions.

P. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of switchboards and adjacent equipment with all required clearances indicated.

2. Include wiring diagrams showing all factory and field connections.

3. Include documentation demonstrating selective coordination.

D. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 2 as production (routine) tests.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Field Quality Control Test Reports.

G. Project Record Documents: Record actual installed locations of switchboards and final equipment settings.

H. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Enclosure Keys: Two of each different key.

3. See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.

B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.

C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Switchboards:

1. ABB/GE: www.geindustrial.com.

2. Eaton Corporation: www.eaton.com.

3. Schneider Electric; Square D Products: www.schneider-electric.us.

4. Siemens Industry, Inc: www.usa.siemens.com.

5. Substitutions: See Section 01 60 00 - Product Requirements.

6. Source Limitations: Provide switchboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.2 SWITCHBOARDS

A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.

D. Front-Connected Switchboards:

1. Feeder Devices: Panel/group-mounted.

2. Arrangement: Front accessible only (not rear accessible), rear aligned.

3. Gutter Access: Bolted covers.

E. Service Conditions:

1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:

a. Altitude: Less than 6,600 feet.

b. Ambient Temperature:

1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F and 104 degrees F.

2) Switchboards Containing Fusible Switches: Between -22 degrees F and 104 degrees F.

2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

F. Short Circuit Current Rating:

1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

2. Minimum Rating: 65,000 rms symmetrical amperes.

3. Listed series ratings are not acceptable.

G. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

H. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.

I. Bussing: Sized in accordance with UL 891 temperature rise requirements.

1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.

2. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection. Neutral bus shall be isolated from ground.

3. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

4. Phase and Neutral Bus Material: Copper.

5. Ground Bus Material: Copper.

J. Conductor Terminations: Suitable for use with the conductors to be installed.

1. Line Conductor Terminations:

a. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.

b. Main and Neutral Lug Type: Mechanical.

2. Load Conductor Terminations:

a. Lug Material: Copper, suitable for terminating copper conductors only.

b. Lug Type:

1) Provide mechanical lugs unless otherwise indicated.

K. Enclosures:

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: NEMA Type 1.

2. Finish: Manufacturer's standard unless otherwise indicated.

L. Future Provisions:

1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2. Equip distribution sections with full height vertical bussing to accommodate maximum utilization of space for devices.

3. Arrange and equip through bus and ground bus to accommodate future installation of additional switchboard sections.

M. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list switchboards as a complete assembly including surge protective device.

N. Arc Flash Energy-Reducing Maintenance Switching: For circuit breakers rated 1200 A or higher, provide a local accessory switch with status indicator light that permits selection of a maintenance mode with alternate electronic trip unit settings for reduced fault clearing time.

O. Owner Metering: Comply with Section 26 27 13.

2.3 OVERCURRENT PROTECTIVE DEVICES

A. Circuit Breakers:

1. Interrupting Capacity:

a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.

b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

2. Molded Case Circuit Breakers:

a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

1) Provide thermal magnetic circuit breakers unless otherwise indicated.

2) Provide electronic trip circuit breakers where indicated.

b. Minimum Interrupting Capacity: As required by the Studies completed in section 26 0573.

c. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

1) Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.

2) Provide interchangeable trip units for circuit breaker frame sizes 100 amperes and larger.

d. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.

1) Provide the following field-adjustable trip response settings:

a) Long time pickup, adjustable by setting dial.

b) Long time delay.

c) Short time pickup and delay.

d) Instantaneous pickup.

e) Ground fault pickup and delay where ground fault protection is indicated.

2) Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control short time delay and ground fault delay functions for system coordination purposes.

3) Provide communication capability where indicated: Compatible with system indicated.

e. Provide the following circuit breaker types where indicated:

1) Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.

f. Provide the following features and accessories where indicated or where required to complete installation:

1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

2) Pad-Lock Provision: For locking circuit breaker handle in OFF position.

3) Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.

4) Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.

5) Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

2.4 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:

1. Dielectric tests.
2. Mechanical operation tests.
3. Grounding of instrument transformer cases test.
4. Electrical operation and control wiring tests, including polarity and sequence tests.
5. Ground-fault sensing equipment test.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive switchboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.

C. Arrange equipment to provide required clearances and maintenance access, inc.

D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch between switchboard and wall.

E. Provide required support and attachment in accordance with Section 26 05 29.

F. Install switchboards plumb and level.

G. Mount switchboards on properly sized nominal 4 inch high concrete pad constructed in accordance with Section 03 30 00.

H. Provide grounding and bonding in accordance with Section 26 05 26.

I. Install all field-installed devices, components, and accessories.

J. Provide fuses complying with Section 26 28 13 for fusible switches as indicated.

K. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

L. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 26 05 73.

M. Provide filler plates to cover unused spaces in switchboards.

N. Identify switchboards in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's reports with submittals.

C. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.

E. Inspect and test in accordance with NETA ATS, except Section 4.

F. Perform inspections and tests listed in NETA ATS, Section 7.1.

G. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

H. Meters: Perform inspections and tests listed in NETA ATS, Section 7.11.2.

I. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.

J. Test shunt trips to verify proper operation.

K. Correct deficiencies and replace damaged or defective switchboards or associated components.

L. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of switchboard covers and doors.

3.5 CLEANING

A. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred surfaces to match original factory finish.

3.6 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of switchboard and associated devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours of training.

3. Instructor: Manufacturer's authorized representative.

4. Location: At project site.

3.7 PROTECTION

A. Protect installed switchboards from subsequent construction operations.

END OF SECTION 26 24 13

DIVISION 26 - ELECTRICAL
SECTION 26 24 16 - PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.3 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendment (2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

F. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

G. NEMA PB 1 - Panelboards; 2011.

H. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

I. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

L. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

M. UL 67 - Panelboards; Current Edition, Including All Revisions.

N. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

O. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

P. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

Q. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

R. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

S. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.

2. Include wiring diagrams showing all factory and field connections.

D. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.

E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

H. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Panelboard Keys: six (6) of each different key.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:

1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ABB/GE: www.geindustrial.com.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Substitutions: See Section 01 60 00 - Product Requirements.

F. Source Limitations: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

2.2 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature:

a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

2. Listed series ratings are not acceptable.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.

2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: NEMA 250, Type 1.

b. Outdoor Locations: NEMA 250 Type 3R.

c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

d. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

2. Boxes: Galvanized steel unless otherwise indicated.

a. Provide wiring gutters sized to accommodate the conductors to be installed.

b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.

c. Provide removable end walls for NEMA Type 1 enclosures.

3. Fronts:

a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.

b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.

c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.

d. Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts..

4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

J. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

K. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

L. Load centers are not acceptable.

2.3 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase and Neutral Bus Material: Copper.

2. Ground Bus Material: Copper.

D. Circuit Breakers:

1. Provide bolt-on type.

2. Provide thermal magnetic circuit breakers unless otherwise indicated.

3. Provide electronic trip circuit breakers where indicated.

E. Enclosures:

1. Provide surface-mounted enclosures unless otherwise indicated.

2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

3. Provide clear plastic circuit directory holder mounted on inside of door.

2.4 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.

2. Phase and Neutral Bus Material: Copper.

3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.

2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

3. Provide clear plastic circuit directory holder mounted on inside of door.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

2. Interrupting Capacity:

a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:

b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

3. Conductor Terminations:

a. Provide mechanical lugs unless otherwise indicated.

b. Lug Material: Copper, suitable for terminating copper conductors only.

4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.

b. Provide interchangeable trip units where indicated.

5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.

a. Provide the following field-adjustable trip response settings:

1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.

2) Long time delay.

3) Short time pickup and delay.

4) Instantaneous pickup.

5) Ground fault pickup and delay where ground fault protection is indicated.

6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

7. Provide the following circuit breaker types where indicated:

a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.

b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.

8. Do not use tandem circuit breakers.

9. Do not use handle ties in lieu of multi-pole circuit breakers.

10. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

11. Provide the following features and accessories where indicated or where required to complete installation:

    a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

    b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.6 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 26 05 29.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

I. Mount floor-mounted power distribution panelboards on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.

J. Provide grounding and bonding in accordance with Section 26 05 26.

K. Install all field-installed branch devices, components, and accessories.

L. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

M. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

N. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 05 73.

O. Provide filler plates to cover unused spaces in panelboards.

P. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads as directed. Also provide for the following:

1. Communications equipment circuits.

2. Intrusion detection and access control system circuits.

Q. Identify panelboards in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.

1. Perform insulation-resistance tests on all control wiring with respect to ground.

2. Test functions of the trip unit by means of secondary injection.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

E. Test GFCI circuit breakers to verify proper operation.

F. Test shunt trips to verify proper operation.

G. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

H. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

3.5 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 24 16

DIVISION 26 - ELECTRICAL
SECTION 26 27 13 - ELECTRICITY METERING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Equipment for Owner electricity metering:

1. Single circuit electricity meters.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 24 13 - Switchboards: For interface with meters specified in this section.

D. Section 26 28 13 - Fuses.

1.3 REFERENCE STANDARDS

A. ANSI C12.1 - Electric Meters - Code for Electricity Metering; 2022.

B. ANSI C12.20 - American National Standard for Electricity Meters - 0.1, 0.2, and 0.5 Accuracy Classes; 2018, with Errata.

C. IEC 62053-21 - Electricity Metering Equipment - Particular Requirements - Part 21: Static Meters for AC Active Energy (Classes 0,5, 1 and 2); 2020.

D. IEC 62053-22 - Electricity Metering Equipment - Particular Requirements - Part 22: Static Meters for AC Active Energy (Classes 0,1S,0,2S and 0,5S); 2020.

E. IEC 62053-23 - Electricity Metering Equipment - Particular Requirements - Part 23: Static Meters for Reactive Energy (Classes 2 and 3); 2020.

F. IEEE 1459 - IEEE Standard Definitions for the Measurement of Electric Power Quantities Under Sinusoidal, Nonsinusoidal, Balanced, or Unbalanced Conditions; 2010.

G. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

H. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

I. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

J. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate work to provide equipment suitable for interface with electricity metering systems to be provided.

2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for electricity metering systems and associated components and accessories. Include ratings, configurations, standard wiring diagrams, dimensions, service condition requirements, and installed features.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Field Quality Control Test Reports.

E. Project Record Documents: Record actual installed locations of meters and final equipment settings.

F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Electricity Meters:

1. ABB: www.electrification.us.abb.com/#sle.

2. Eaton Corporation: www.eaton.com/#sle.

3. Schneider Electric: www.se.com/#sle.

4. Siemens Industry, Inc: www.new.siemens.com/#sle.

5. Substitutions: See Section 01 60 00 - Product Requirements.

6. Source Limitations: Provide electricity meters produced by single manufacturer and obtained from single supplier.

2.2 EQUIPMENT FOR OWNER ELECTRICITY METERING

A. Provide microprocessor-based digital electricity metering systems including all instrument transformers, wiring, and connections necessary for measurements specified.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide electricity metering systems and associated components compatible with the equipment and associated circuits to be metered.

D. Service Conditions: Provide electricity meters suitable for operation under the service conditions at the installed location.

E. Enclosures:

1. Where not furnished by manufacturer, provide required cabinets and enclosures in accordance with Section 26 05 33.16.

2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 12.

3. Finish: Manufacturer's standard unless otherwise indicated.

F. Instrument Transformers:

1. Comply with IEEE C57.13, where applicable.

2. Select suitable ratio, burden, and accuracy as required for connected devices.

3. Current Transformers: Compatible with connected meters; replace meters damaged by connection of incompatible current transformers. Provide shorting terminal blocks for connection of secondaries where applicable.

4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

2.3 SINGLE CIRCUIT ELECTRICITY METERS

A. Single Circuit Electricity Meter for switchboard:

1. Accuracy:

a. Real/Active Power/Energy: Revenue grade; plus/minus 1.0 percent; complying with ANSI C12.1 and/or IEC 62053-21 Class 1.

b. Reactive Power/Energy: Plus/minus 2.0 percent complying with IEC 62053-23 Class 2.

2. Measured Parameters:

a. Voltage (Volts AC); line-to-line and line-to-neutral; per phase.

b. Current (Amps); per phase.

c. Frequency (Hz).

d. Real/active power (kW); per phase and total of all phases.

e. Reactive power (kVAR); per phase and total of all phases.

f. Apparent power (kVA); per phase and total of all phases.

g. Power factor; per phase and total of all phases.

h. Real/active energy (kWh).

i. Reactive energy (kVARh).

j. Apparent energy (kVAh).

k. Power demand; real/active, reactive, and apparent; present and maximum.

l. Current demand.

3. Data logging.

a. Storage Capacity: 30 days of readings at 15 minute intervals.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of metering systems and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive meters.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment components in accordance with Section 26 05 29.

D. Provide grounding and bonding in accordance with Section 26 05 26.

E. Provide fuses complying with Section 26 28 13 as required.

F. Identify meters and associated wiring in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Meters: Perform inspections and tests listed in NETA ATS, Section 7.11.2.

D. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.

E. Correct deficiencies and replace damaged or defective metering system components.

3.4 ADJUSTING

A. Program system parameters according to requirements of Owner.

3.5 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.6 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours of training.

3. Instructor: Manufacturer's authorized representative.

4. Location: At project site.

3.7 PROTECTION

A. Protect installed system components from subsequent construction operations.

END OF SECTION 26 27 13

DIVISION 26 - ELECTRICAL
SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates and covers.

D. Floor box service fittings.

E. Poke-through assemblies.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 33.16 - BOXES.

D. Section 26 09 23 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.

E. Section 26 29 13 - Enclosed Controllers: Manual motor starters and horsepower rated motor-starting switches without overload protection.

1.3 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h, with Amendments (2017).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2014g, with Amendment (2017).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

L. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.

3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.

4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.

5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Samples: Provide One sample of each color available for thermoplastic cover plates upon request.

D. Field Quality Control Test Reports.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data:

1. Wall Dimmers: Include information on operation and setting of presets.

2. GFCI Receptacles: Include information on status indicators.

G. Project Record Documents: Record actual installed locations of wiring devices.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Wall Plates: One of each style, size, and finish.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.1 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide tamper resistant receptacles for receptacles installed as shown on drawings.

E. Provide GFCI protection for receptacles installed within 6 feet of sinks.

F. Provide GFCI protection for receptacles serving electric drinking fountains.

G. Do not use combination switch/receptacle devices.

H. For flush floor service fittings, use tile rings for installations in tile floors.

I. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.2 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices Installed in Finished Spaces: White with matching nylon wall plate.

C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.

D. Wiring Devices Installed in Wet or Damp Locations: Gray with specified weatherproof cover.

E. Flush Floor Box Service Fittings: finish to match other wiring devices with aluminum cover and ring/flange.

2.3 ALL WIRING DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

B. Finishes:

2.4 WALL SWITCHES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com.
2. Leviton Manufacturing Company, Inc: www.leviton.com.
3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us.
4. Acuity Controls, www.acuity.com
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.5 RECEPTACLES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com/wiringdevice-kellems/en.
2. Leviton Manufacturing Company, Inc: www.leviton.com.
3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/passandseymour.aspx.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:

1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

D. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.

a. Provide test and reset buttons of same color as device.

2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

2.6 Wall Plates and Covers

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com/wiringdevice-kellems/en.

2. Leviton Manufacturing Company, Inc: www.leviton.com.

3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/passandseymour.aspx..

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.

2. Size: Standard.

3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

D. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

E. Weatherproof Receptacle Covers for Wet or Damp Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.7 FLOOR BOX SERVICE FITTINGS

A. Manufacturers:

1. Hubbell Incorporated: System ONE Recessed

2. Thomas & Betts Corporation: http://www.tnb.com/pub/en/node/10.

3. Wiremold, a brand of Legrand North America, Inc: Evolution Series.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Service fittings compatible with floor boxes provided under Section 26 05 33.16 with components, adapters, and trims required for complete installation.

C. Flush Floor Service Fittings:

1. Dual Service Flush Combination Outlets:

a. Cover: Rectangular.

b. Configuration:

1) Power: Two standard convenience duplex receptacle(s) with duplex flap opening(s).

2) Voice and Data Jacks: Provided by others.

2. Accessories:

a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.

b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.

1. Mounting Heights to top of box: As indicated on the drawings.

2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

L. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 26 27 26

DIVISION 26 - ELECTRICAL
SECTION 26 28 13 - FUSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fuses.

B. Spare fuse cabinet.

1.2 RELATED REQUIREMENTS

A. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

B. Section 26 05 73 - Power System Studies: Additional criteria for the selection of protective devices specified in this section.

C. Section 26 24 13 - Switchboards: Fusible switches.

D. Section 26 24 16 - Panelboards: Fusible switches.

E. Section 26 28 16.16 - Enclosed Switches: Fusible switches.

F. Section 26 29 13 - Enclosed Controllers: Fusible switches.

1.3 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses; Current Edition, Including All Revisions.

E. UL 248-8 - Low-Voltage Fuses - Part 8: Class J Fuses; Current Edition, Including All Revisions.

F. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses; Current Edition, Including All Revisions.

G. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

H. UL 248-15 - Low-Voltage Fuses - Part 15: Class T Fuses; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.

a. Fusible Enclosed Switches: See Section 26 28 16.16.

2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

1. Spare Fuse Cabinet: Include dimensions.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Spare Fuse Cabinet Keys: Two.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com/content/public/en/bussmann.html.

B. Littelfuse, Inc: www.littelfuse.com.

C. Mersen: ep-us.mersen.com.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 APPLICATIONS

A. Feeders:

1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.

2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

B. General Purpose Branch Circuits: Class RK1, time-delay.

C. Individual Motor Branch Circuits: Class RK1, time-delay.

D. In-Line Protection for Pole-Mounted Luminaires: Class CC, time-delay.

E. Primary Protection for Control Transformers: Class CC, time-delay.

2.3 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

1. Class RK1, Time-Delay Fuses:

2. Class RK1, Fast-Acting, Non-Time-Delay Fuses:

H. Class L Fuses: Comply with UL 248-10.

1. Class L, Time-Delay Fuses:

2. Class L, Fast-Acting, Non-Time-Delay Fuses:

I. Class CC Fuses: Comply with UL 248-4.

1. Class CC, Fast-Acting, Non-Time-Delay Fuses:

J. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

K. Provide the following accessories where indicated or where required to complete installation:

1. Fuseholders: Compatible with indicated fuses.

2. Fuse Reducers: For adapting indicated fuses to permit installation in switch designed for fuses with larger ampere ratings.

2.4 SPARE FUSE CABINET

A. Description: Wall-mounted sheet metal cabinet with shelves and hinged door with cylinder lock, suitably sized to store spare fuses and fuse pullers specified.

B. Finish: Manufacturer's standard, factory applied grey finish unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that mounting surfaces are ready to receive spare fuse cabinet.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

C. Install spare fuse cabinet where indicated.

END OF SECTION 26 28 13

DIVISION 26 - ELECTRICAL
SECTION 26 28 16.16 - ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed safety switches.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 05 73 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.

E. Section 26 28 13 - Fuses.

F. Section 26 29 13 - Enclosed Controllers: Manual motor controllers.

G. Section 26 36 00 - Transfer Switches: Automatic and non-automatic switches listed for use as transfer switch equipment.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.

2. Include wiring diagrams showing all factory and field connections.

D. Field Quality Control Test Reports.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

F. Project Record Documents: Record actual locations of enclosed switches.

G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ABB/GE: www.geindustrial.com.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Substitutions: See Section 01 60 00 - Product Requirements.

F. Source Limitations: Provide enclosed switches and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.2 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:

1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

2. Minimum Ratings:

a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.

b. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.

c. Double Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.

G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

H. Provide with switch blade contact position that is visible when the cover is open.

I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.

1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

J. Conductor Terminations: Suitable for use with the conductors to be installed.

K. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

L. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

M. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Indoor Damp and Wet Locations: NEMA 4X Stainless Steel.

c. Indoor Corrosive Locations (Chemical Rooms): NEMA 4X non-metallic.

d. Indoor Storage and Maintenance Locations: NEMA 12.

e. Outdoor Locations: Type 3R.

2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

N. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

O. Heavy Duty Switches:

1. Comply with NEMA BS 31047.

2. Conductor Terminations:

a. Provide mechanical lugs unless otherwise indicated.

b. Lug Material: Copper, suitable for terminating copper conductors only.

3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

a. Provide means for locking handle in the ON position.

P. General Duty Switches: NOT ALLOWED

Q. Provide the following features and accessories where indicated or where required to complete installation:

1. Hubs: As required for environment type; sized to accept conduits to be installed.

2. Integral fuse pullers.

3. Auxiliary Switch: DPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.

4. Viewing Window: Positioned over switch blades for visual confirmation of contact position with door closed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 05 26.

H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

J. Identify enclosed switches in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 28 16.16

DIVISION 26 - ELECTRICAL
SECTION 26 29 13 - ENCLOSED CONTROLLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed NEMA controllers for low-voltage (600 V and less) applications:

1. Magnetic motor starters.

2. General purpose contactors.

3. Manual motor starters.

4. Motor-starting switches without overload protection.

B. Overcurrent protective devices for motor controllers, including overload relays.

C. Control accessories:

1. Auxiliary contacts.

2. Pilot devices.

3. Control and timing relays.

4. Control power transformers.

5. Control terminal blocks.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

E. Section 260916 - Electric Controls and Relays: For control accessories.

F. Section 26 28 13 - Fuses: Fuses for fusible switches.

1. Includes requirements for spare fuses and spare fuse cabinets.

G. Section 26 29 23 - Variable-Frequency Motor Controllers.

1.3 REFERENCE STANDARDS

A. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

E. NEMA IA 10039 - Control Circuit and Pilot Devices; 2025.

F. NEMA IA 10030 - Industrial Control and Systems: Enclosures; 2024.

G. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

K. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.

2. Coordinate the work to provide motor controllers and associated overload relays suitable for use with the actual motors to be installed.

3. Coordinate the work to provide controllers and associated wiring suitable for interface with control devices to be installed.

4. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

5. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

6. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.

1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate dimensions, voltage, controller sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of enclosed controllers and adjacent equipment with all required clearances indicated.

2. Include wiring diagrams showing all factory and field connections.

3. Include documentation demonstrating selective coordination upon request.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Field Quality Control Test Reports.

F. Project Record Documents: Record actual installed locations of controllers and final equipment settings.

1. Include nameplate data of actual installed motors and associated overload relay selections and settings.

G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Electronic Trip Circuit Breakers: Provide one portable test set.

3. Indicating Lights: Two of each different type.

4. See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ABB/GE: www.geindustrial.com.

B. Eaton Corporation; Cutler-Hammer Product: www.eaton.com.

C. Rockwell Automation, Inc; Allen-Bradley Products: ab.rockwellautomation.com/#sle.

D. Schneider Electric; Square D Products: www.schneider-electric.us.

E. Siemens Industry, Inc: www.usa.siemens.com.

F. Substitutions: See Section 01 60 00 - Product Requirements.

G. Source Limitations: Furnish enclosed motor controllers and associated components produced by a single manufacturer and obtained from a single supplier.

2.2 ENCLOSED CONTROLLERS

A. Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.

D. Service Conditions:

1. Provide controllers and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

E. Short Circuit Current Rating:

1. Provide controllers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

2. Listed series ratings are not acceptable.

F. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures:

1. Comply with NEMA IA 10030.

2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

    a. Indoor Clean, Dry Locations: Type 1 or Type 12.

    b. Outdoor Locations: Type 3R or Type 4.

    c. Hazardous (Classified) Locations: Type 7/9, as required for the classification of the installed location.

3. Finish: Manufacturer's standard unless otherwise indicated.

I. Instrument Transformers:

1. Comply with IEEE C57.13.

2. Select suitable ratio, burden, and accuracy as required for connected devices.

3. Current Transformers: Connect secondaries to shorting terminal blocks.

4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

J. Magnetic Motor Starters: Combination type unless otherwise indicated.

1. Combination Magnetic Motor Starters: NEMA ICS 2, Class A combination motor controllers with magnetic contactor(s), externally operable disconnect and overload relay(s).

2. Configuration: Full-voltage non-reversing unless otherwise indicated.

3. Minimum Starter Size: NEMA Size 0.

4. Use of non-standard starter sizes smaller than specified standard NEMA sizes is not permitted.

5. Disconnects: Circuit breaker type.

    a. Circuit Breakers: Motor circuit protectors (magnetic-only) unless otherwise indicated or required.

    b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.

c. Provide auxiliary interlock for disconnection of external control power sources where applicable.

6. Overload Relays: Bimetallic thermal type unless otherwise indicated.

7. Pilot Devices Required:

a. Furnish local pilot devices for each unit as specified below unless otherwise indicated on drawings.

b. Single-Speed, Non-Reversing Starters:

1) Pushbuttons: START-STOP.

2) Selector Switches: HAND/OFF/AUTO.

3) Indicating Lights: Red ON, Green OFF.

c. Single-Speed, Reversing Starters:

1) Pushbuttons: FOR-REV-STOP.

2) Selector Switches: FOR/OFF/REV.

3) Indicating Lights: Red FOR, Red REV, Green OFF.

d. Two-Speed Starters:

1) Pushbuttons: FAST-OFF-SLOW.

2) Selector Switches: SLOW/OFF/FAST.

3) Indicating Lights: Red FAST, Red SLOW, Green OFF.

K. General Purpose Contactors: Combination type unless otherwise indicated.

1. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect, but without integral overload relay(s).

2. Configuration: Full-voltage non-reversing unless otherwise indicated.

3. Minimum Contactor Size: NEMA Size 0.

4. Use of non-standard contactor sizes smaller than specified standard NEMA sizes is not permitted.

5. Disconnects: Circuit breaker type.

    a. Circuit Breakers: Thermal magnetic unless otherwise indicated or required.

    b. Disconnect Switches: Fusible or nonfusible type as indicated.

    c. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.

    d. Provide auxiliary interlock for disconnection of external control power sources where applicable.

6. Pilot Devices Required:

    a. Furnish local pilot devices for each unit as specified below unless otherwise indicated on drawings.

    b. Contactors for motor applications where overload protection is provided separately or where motor contains integral thermal protectors to be provided with pilot devices as specified for magnetic motor starters above.

L. Manual Motor Starters:

1. Description: NEMA ICS 2, Class A manually-operated motor controllers with overload relay(s).

2. Configuration: Non-reversing unless otherwise indicated.

3. Fractional-Horsepower Manual Motor Starters:

    a. Furnish with toggle operator.

    b. Overload Relays: Bimetallic or melting alloy thermal type.

    c. Provide means for locking operator in the OFF position.

    d. Furnish Red ON indicating light where not within sight of equipment.

4. Integral-Horsepower Manual Motor Starters:

    a. Furnish with toggle or pushbutton operator.

    b. Overload Relays: Bimetallic or melting alloy thermal type.

c. Provide means for locking operator in the OFF position.

d. Furnish Red ON indicating light where not within sight of equipment.

e. Provide auxiliary contact where indicated; normally open (NO) or normally closed (NC) as indicated or as required.

M. Motor-Starting Switches: Horsepower-rated switches without overload protection; toggle operator.

2.3 OVERCURRENT PROTECTIVE DEVICES

A. Overload Relays:

1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.

2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.

3. Trip-free operation.

4. Visible trip indication.

5. Resettable.

a. Employ manual reset unless otherwise indicated.

b. Employ automatic reset or remote reset where indicated.

c. Do not employ automatic reset with two-wire control.

6. Bimetallic Thermal Overload Relays:

a. Provide ambient temperature compensation.

b. Interchangeable current elements/heaters.

c. Adjustable trip; plus/minus 10 percent of nominal, minimum.

d. Trip test function.

7. Melting Alloy Thermal Overload Relays:

a. Interchangeable current elements/heaters.

8. Solid-State Overload Relays:

    a. Selectable inverse-time trip class rating; available ratings of Class 10, 20, and 30, minimum.

    b. Adjustable full load current.

    c. Phase loss protection.

    d. Phase imbalance protection.

    e. Ground fault protection.

    f. Ambient temperature insensitive.

    g. Thermal memory.

    h. Trip test function.

    i. Provide isolated alarm contact.

B. Fusible Disconnect Switches:

1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA BS 31047, and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.

2. Fuse Clips: As required to accept indicated fuses.

3. Provide externally operable handle with means for locking in the OFF position. Provide means for locking switch cover in the closed position. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

C. Circuit Breakers:

1. Interrupting Capacity (not applicable to motor circuit protectors):

    a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.

    b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

2. Motor Circuit Protectors:

a. Description: Instantaneous-trip circuit breakers furnished with magnetic instantaneous tripping elements for short circuit protection, but not with thermal inverse time tripping elements for overload protection; UL 489 recognized only for use as part of a listed combination motor controller with overload protection; ratings, configurations, and features as indicated on the drawings.

b. Provide field-adjustable magnetic instantaneous trip setting.

c. Provide the following features and accessories where indicated or where required to complete installation:

1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

2) Pad-Lock Provision: For locking circuit breaker handle in OFF position.

3) Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.

4) Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.

5) Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

3. Molded Case Circuit Breakers:

a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.

1) Provide thermal magnetic circuit breakers unless otherwise indicated.

b. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

1) Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.

c. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.

1) Provide the following field-adjustable trip response settings:

a) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.

b) Long time delay.

c) Short time pickup and delay.

d) Instantaneous pickup.

e) Ground fault pickup and delay where ground fault protection is indicated.

d. Provide the following features and accessories where indicated or where required to complete installation:

1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

2) Pad-Lock Provision: For locking circuit breaker handle in OFF position.

3) Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.

4) Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.

5) Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

2.4 CONTROL ACCESSORIES

A. Auxiliary Contacts:

1. Comply with NEMA IA 10039.

2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally

open (NO) and one normally closed (NC) spare contact for each magnetic motor starter, minimum.

B. Pilot Devices:

1. Comply with NEMA IA 10039; heavy-duty type.

2. Nominal Size: 30 mm.

3. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.

4. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.

5. Indicating Lights: Push-to-test type unless otherwise indicated.

6. Provide LED lamp source for indicating lights and illuminated devices.

C. Control and Timing Relays:

1. Comply with NEMA IA 10039.

2. Provide number and type of relays indicated or required to perform necessary functions.

3. Timing Relays: Electronic or pneumatic as indicated.

a. Adjustable Timing Range: As indicated on drawings.

4. Multi-Speed Motor Starters: Employ accelerating relays, decelerating relays, and compelling relays where indicated.

5. Accelerating Relays: Starts motor at low speed and then accelerates automatically through definite time intervals for each successive speed until selected speed is attained.

6. Decelerating Relays: Allows motor to decelerate automatically through definite time intervals for each successive speed until selected speed is attained.

7. Compelling Relays: Requires motor to start at low speed before a higher speed can be selected.

D. Control Power Transformers:

1. Size to accommodate burden of contactor coil(s) and all connected auxiliary devices, plus _____ VA spare capacity.

2. Include primary and secondary fuses.

E. Control Terminal Blocks: Include 25 percent spare terminals.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings of enclosed controllers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed controllers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install controllers in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install enclosed controllers plumb and level.

F. Provide grounding and bonding in accordance with Section 26 05 26.

G. Install all field-installed devices, components, and accessories.

H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated.

I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

J. Set field-adjustable controllers and associated components according to installed motor requirements, in accordance with manufacturer's recommendations and NFPA 70.

K. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 26 05 73.

L. Identify enclosed controllers in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Motor Starters: Perform inspections and tests listed in NETA ATS, Section 7.16.1.1. Tests listed as optional are not required.

D. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

E. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 200. Tests listed as optional are not required.

F. Correct deficiencies and replace damaged or defective enclosed controllers or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

3.6 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of controllers to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of enclosed controllers and associated devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours of training.

3. Instructor: Manufacturer's authorized representative.

4. Location: At project site.

3.7 PROTECTION

A. Protect installed enclosed controllers from subsequent construction operations.

END OF SECTION 26 29 13

DIVISION 26 - ELECTRICAL
SECTION 26 29 23 - VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Variable-frequency motor controllers for low-voltage (600 V and less) AC motor applications.

B. Overcurrent protective devices for motor controllers, including overload relays.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Housekeeping pads.

B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Variable-frequency drive cable.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

D. Section 26 05 29 - Hangers and Supports for Electrical Systems.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 05 73 - Power System Studies: Additional criteria for selection and adjustment of equipment and associated protective devices specified in this section.

G. Section 26 28 13 - Fuses.

1.3 REFERENCE STANDARDS

A. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).

B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

F. NEMA IA 10039 - Control Circuit and Pilot Devices; 2025.

G. NEMA IA 10030 - Industrial Control and Systems: Enclosures; 2024.

H. NEMA IS 10033 - Adjustable Speed Drives; 2020 (Reapproved 2025).

I. NEMA IS 10034 - Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems; 2022 (Reapproved 2025).

J. NEMA ICS 7.2 - Application Guide for AC Adjustable Speed Drive Systems; 2021.

K. NEMA ICS 61800-2 - Adjustable Speed Electrical Power Drive Systems, Part 2: General Requirements-Rating Specifications for Low Voltage Adjustable Frequency AC Power Drive Systems; 2005.

L. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

M. NEMA MG 00001 - Motors and Generators; 2024.

N. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

P. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

Q. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

R. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

S. UL 61800-5-1 - Standard for Adjustable Speed Electrical Power Drive Systems - Part 5-1: Safety Requirements – Electrical, Thermal, and Energy (Ed. 2); Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate work to avoid placement of ductwork, piping, equipment, and other obstructions within dedicated equipment spaces and working clearances required by NFPA 70.

2. Coordinate work to provide motor controllers suitable for use with motors.

3. Coordinate work to provide controllers and associated wiring suitable for interface with control devices.

4. Coordinate arrangement of electrical equipment with dimensions and clearance requirements.

5. Verify with manufacturer that conductor terminations are suitable for use with conductors.

6. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.

1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate dimensions, voltage, controller sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of controllers and adjacent equipment with required clearances indicated.

2. Include wiring diagrams showing factory and field connections.

3. Indicate proposed short circuit current ratings are fully rated.

4. Include documentation demonstrating selective coordination upon request.

D. Derating Calculations: Indicate ratings adjusted for applicable service conditions.

E. Specimen Warranty: Submit sample of manufacturer's warranty.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Field quality control test reports.

H. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

I. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

J. Project Record Documents: Record actual installed locations of controllers and final equipment settings.

1. Include nameplate data of actual installed motors and associated overload relay selections and settings.

2. Motor Circuit Protectors: Include magnetic instantaneous trip settings.

K. Maintenance Materials: Furnish following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements for additional provisions.

2. Indicating Lights: Two of each different type.

3. Air Filters: Two of each different type.

4. See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain copy of each referenced document that prescribes execution requirements at project site.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1. Authorized service facilities located within 200 miles of project site.

D. Installer Qualifications: Company with minimum three years documented experience with variable-frequency motor control systems of similar size, type, and complexity; manufacturer's authorized installer.

E. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store in clean, dry space. Maintain factory wrapping or provide additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide minimum 18-month manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Variable-Frequency Motor Controllers:

1. Danfoss: www.danfoss.com.

2. Eaton Corporation: www.eaton.com.

3. Rockwell Automation, Inc.; Allen-Bradley Products: ab.rockwellautomation.com.

4. Schneider Electric; Square D Products: www.schneider-electric.us.

5. Siemens Industry, Inc: www.usa.siemens.com.

6. Toshiba International Corporation: www.toshiba.com/tic/motors-drives

7. Yaskawa Electric America, Inc.: http://www.yaskawadrive.com

B. Substitutions: See Section 01 60 00 - Product Requirements.

C. Source Limitations: Provide variable-frequency motor controllers and associated components produced by single manufacturer and obtained from single supplier.

2.2 VARIABLE-FREQUENCY MOTOR CONTROLLERS

A. Provide variable-frequency motor control system consisting of required controller assemblies, operator interfaces, control power transformers, instrumentation and control wiring, sensors, accessories, system programming, etc. as necessary for complete operating system.

B. Provide products listed, classified, and labeled as suitable for purpose intended.

C. Variable-Frequency Motor Controller:

1. Configuration: Packaged controller, nonbypass.

2. Rectifier/Converter: Diode-based, 12-pulse type.

3. Control Method: Scalar/volts per hertz; open-loop, without feedback.

4. Filtering: Provide input/line reactor and output/load reactor.

5. Features:

a. PID control.

b. Safety interlock.

c. PTC motor thermistor input. Coordinate with motor provided.

D. Controller Assemblies: Comply with NEMA IS 10033, NEMA IS 10034, and NEMA ICS 61800-2; list and label as complying with UL 61800-5-1 or UL 508A as applicable.

E. Provide controllers selected for actual installed motors and coupled mechanical loads in accordance with NEMA ICS 7.2, NEMA MG 00001 Part 30, and recommendations of manufacturers of both controller and load, where not in conflict with specified requirements; considerations include, but are not limited to:

1. Motor type induction inverter duty rating for induction motors.

2. Motor load type variable torque.

3. Motor nameplate data.

4. Requirements for speed control range and speed regulation.

5. Motor suitability for bypass starting method, where applicable.

F. Devices on Load Side of Controller: Suitable for application across full controller output frequency range.

G. Operating Requirements:

1. Input Voltage Tolerance: Plus/minus 10 percent of nominal.

2. Input Frequency Tolerance: Plus/minus 5 percent of nominal.

3. Efficiency: Minimum of 96 percent at full speed and load.

4. Input Displacement Power Factor: Minimum of 0.96 throughout speed and load range.

5. Overload Rating:

a. Variable Torque Loads: Minimum of 110 percent of nominal for 60 seconds.

H. Power Conversion System: Microprocessor-based, pulse width modulation type consisting of rectifier/converter, DC bus/link, and inverter.

1. Rectifier/Converter: Diode-based, 12-pulse type unless otherwise indicated.

I. Control System:

1. Provide microprocessor-based control system for automatic control, monitoring, and protection of motors. Include sensors, wiring, and connections necessary for functions and status/alarm indications specified.

2. Provide integral operator interface for controller programming, display of status/alarm indications, fault reset, and local control functions including motor run/stop, motor forward/reverse selection, motor speed increase/decrease, and local/remote control selection.

3. Control Functions:

a. Control Method: Scalar/volts per hertz unless otherwise indicated.

1) Scalar/Volts per Hertz Control: Provide IR compensation for improved low-speed torque.

b. Adjustable acceleration and deceleration time; linear and S-curve ramps; selectable coast to stop.

c. Adjustable minimum/maximum speed limits.

d. Adjustable pulse width modulation switching carrier frequency.

e. Adjustable motor slip compensation.

f. Selectable autorestart after noncritical fault; programmable number of time delay between restart attempts.

g. Automatic response to loss of speed reference; Selectable to run motor at last known speed, run motor at designated speed, or stop motor.

h. PID Control: Provide integral PID controller employing feedback for closed-loop control.

i. Selectable frequency-skipping; minimum of three independently adjustable bands.

j. Automatic catching of rotating motor.

k. Energy-saving algorithms.

l. Safety Interlock: Provide permissive run safety interlock capability for interlocking with motor safety switch; upon activation of designated input, stop and prevent operation of motor; operational in both drive and bypass modes where applicable.

m. Damper/Valve Control: Provide damper/valve control capability where indicated or required; upon receiving motor start command, activate designated damper/valve output and delay motor start until activation of designated end switch input confirms damper/valve operation.

4. Status Indications:

a. Motor run/stop status.

b. Motor forward/reverse status.

c. Local/remote control status.

d. Output voltage.

e. Output current.

f. Output frequency.

g. DC bus voltage.

h. Motor speed.

i. Speed reference.

j. Elapsed run time.

k. Controller temperature.

l. Discrete input/output status.

m. Analog input/output values.

5. Protective Functions/Alarm Indications:

a. Overcurrent.

b. Motor overload.

c. Undervoltage.

d. Overvoltage.

e. Controller overtemperature.

f. Input/output phase loss.

g. Output short circuit protection.

h. Output ground fault protection.

6. Inputs:

a. Digital Input(s): Coordinate with control system provider..

b. Analog Input(s): Coordinate with control system provider..

c. PTC motor thermistor input where indicated. Coordinate with motor provide.

7. Outputs:

a. Analog Output(s): Coordinate with contol system provider.

b. Relay Output(s): Coordinate with control system provider.

8. Communications: Compatible with connected control systems. Provide accessories necessary for proper interface.
    a. Ethernet Communications: Coordinate with control system provider.
    b. Remote Monitoring Capabilities:
        1) Motor run/stop status.
        2) Hand-off-auto status.
        3) Fault information.
        4) Discrete input/output status.
        5) Analog input/output values.
    c. Remote Control Capabilities:
        1) Motor run/stop command.
        2) Hand-off-auto selection.
        3) Speed adjustment.
        4) Fault reset.
9. Features:
    a. Password-protected security access.
    b. Event log.

J. Power Conditioning/Filtering:

1. Provide DC link choke or input/line reactor for each controller unless otherwise indicated or required.
2. Provide LCL filter for controllers with IGBT-based active front end rectifier/converter.
3. Provide input surge protection.
4. Provide where indicated:
    a. Input/line reactor.

b. Output/load reactor.

5. Reactor Impedance: 3 percent, unless otherwise indicated or required.

K. Packaged Controllers: Controllers factory-mounted in separate enclosure with externally operable disconnect and specified accessories.

1. Disconnects: Circuit breaker or disconnect switch type.

a. Disconnect Switches: Fusible type or nonfusible type with separate input fuses.

b. Provide externally operable handle with means for locking in OFF position. Provide safety interlock to prevent opening cover with disconnect in ON position with capability of overriding interlock for testing purposes.

c. Provide auxiliary interlock for disconnection of external control power sources where applicable.

2. Provide door-mounted remote operator interface.

L. Service Conditions:

1. Provide controllers and associated components suitable for operation under following service conditions without derating:

a. Altitude: Less than 3,300 feet.

b. Ambient Temperature: Between 32 degrees F and 104 degrees F.

M. Short Circuit Current Rating:

1. Provide controllers with listed short circuit current rating not less than available fault current at installed location as determined by short circuit study performed in accordance with Section 26 05 73.

2. Provide line/input reactors where specified by manufacturer for required short circuit current rating.

N. Selectivity: Where requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

O. Conductor Terminations: Suitable for use with conductors to be installed.

P. Enclosures:

1. Comply with NEMA IA 10030.
2. NEMA EN 10250 Environment Type or Equivalent IEC 60529 Rating: Unless otherwise indicated, as specified for following installation locations:
    a. Indoor Clean, Dry Locations: Type 1 or Type 12.
    b. Outdoor Locations: Type 3R or Type 4.
3. Finish: Manufacturer's standard unless otherwise indicated.
4. Cooling: Forced air or natural convection as determined by manufacturer.
5. Enclosure Space Heaters:
    a. Provide in each controller enclosure installed outdoors and in unconditioned indoor spaces.
    b. Size according to manufacturer's recommendations for worst case ambient temperature to prevent condensation.
    c. Heater Control: Thermostat.
    d. Heater Power Source: Provide connection to transformer factory-installed in enclosure or suitable external branch circuit as indicated or as required.

Q. Instrument Transformers:

1. Provide instrument transformers as required for operation and control. Comply with IEEE C57.13.
2. Select suitable ratio, burden, and accuracy as required for connected devices.
3. Current Transformers: Connect secondaries to shorting terminal blocks.
4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

R. Interface with Other Work:

1. Provide products compatible with other systems requiring interface with controllers.

2.3 OVERCURRENT PROTECTIVE DEVICES

A. Overload Relays:

1. Provide overload relays and, where applicable, associated current elements/heaters selected for actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
2. Comply with NEMA ICS 2.
3. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
4. Trip-free operation.
5. Visible trip indication.
6. Resettable.
    a. Employ manual reset unless otherwise indicated.
    b. Do not employ automatic reset with two-wire control.
7. Solid State Overload Relays:
    a. Selectable inverse-time trip class rating; available ratings of Class 10, 20, and 30, minimum.
    b. Adjustable full load current.
    c. Phase loss protection.
    d. Phase imbalance protection.
    e. Ground fault protection.
    f. Ambient temperature insensitive.
    g. Thermal memory.
    h. Repeat Trip Accuracy: Plus/minus 2 percent, minimum.
    i. Trip test function.
    j. Provide isolated alarm contact.

B. Circuit Breakers:

1. Molded Case Circuit Breakers:

a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489; ratings, configurations, and features as indicated or as required.

1) Provide electronic trip circuit breakers.

b. Interrupting Capacity:

1) Provide circuit breakers with interrupting capacity as required to provide short circuit current rating indicated, but not less than specified minimum requirements.

2) Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than short circuit current rating indicated.

c. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.

1) Provide field-adjustable trip response settings:

a) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.

b) Long time delay.

c) Short time pickup and delay.

d) Instantaneous pickup.

e) Ground fault pickup and delay where ground fault protection is indicated.

d. Provide following features and accessories where indicated or where required to complete installation:

1) Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.4 ACCESSORIES

A. Auxiliary Contacts:

1. Comply with NEMA IA 10039.

2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking.

B. Control Power Transformers:

1. Size to accommodate burden of contactor coil(s) and connected auxiliary devices.

2. Include primary and secondary fuses.

C. Control Terminal Blocks: Include 25 percent spare terminals.

2.5 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Factory test controllers in accordance with NEMA ICS 61800-2.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings of controllers are consistent with indicated requirements.

C. Verify that mounting surfaces are ready to accept controllers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install controllers in accordance with NECA 1 (general workmanship).

C. Install in accordance with NEMA IS 10034 and manufacturer's instructions.

D. Do not exceed manufacturer's recommended maximum cable length between controller and motor.

E. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

F. Provide required support and attachment in accordance with Section 26 05 29.

G. Install controllers plumb and level.

H. Unless otherwise indicated, mount floor-mounted controllers on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.

I. Provide grounding and bonding in accordance with Section 26 05 26.

J. Install field-installed devices, components, and accessories.

K. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

L. Set field-adjustable settings of controllers and associated components according to installed motor requirements, in accordance with recommendations of manufacturers of controller and load.

M. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 26 05 73.

N. Identify controllers in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Provide services of manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's reports with submittals.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Perform inspections and tests listed in NETA ATS, Section 7.17. Insulation-resistance test on control wiring listed as optional is not required.

E. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1. Tests listed as optional are not required.

F. Test for proper interface with other systems.

G. Correct deficiencies and replace damaged or defective controllers or associated components.

H. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

3.6 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training for additional requirements.

C. Demonstration: Demonstrate proper operation of controllers to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of controllers and associated devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours of training.

3. Instructor: Manufacturer's authorized representative.

4. Location: At project site.

3.7 PROTECTION

A. Protect installed controllers from subsequent construction operations.

3.8 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements relating to maintenance service.

B. Provide trouble call-back service upon notification by Owner:

1. Provide on-site response within 4 hours of notification.

2. Include allowance for call-back service during normal working hours at no extra cost to Owner.

3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION 26 29 23

DIVISION 26 - ELECTRICAL
SECTION 26 32 13 - ENGINE GENERATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:

1. Generator set enclosure.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 23 11 13 - Facility Fuel-Oil Piping:

1. Diesel fuel piping.

2. Remote main diesel fuel tank (bulk tank).

3. Installation of diesel fuel system day tank specified in this section.

C. Section 23 11 23 - Facility Natural-Gas Piping.

D. Section 23 11 26 - Facility Liquefied-Petroleum Gas Piping.

E. Section 23 31 00 - HVAC Ducts and Casings.

F. Section 23 51 00 - Breechings, Chimneys, and Stacks: Engine exhaust piping.

1. Includes installation of exhaust silencer specified in this section.

G. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

H. Section 26 05 29 - Hangers and Supports for Electrical Systems.

I. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

J. Section 26 36 00 - Transfer Switches.

1.3 REFERENCE STANDARDS

A. ASTM D975 - Standard Specification for Diesel Fuel Oils; 2017.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA/EGSA 404 - Standard for Installing Generator Sets; 2014.

D. NEMA MG 00001 - Motors and Generators; 2024.

E. NFPA 30 - Flammable and Combustible Liquids Code; 2015.

F. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines; 2015.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 99 - Health Care Facilities Code; 2021, with Amendment.

I. NFPA 110 - Standard for Emergency and Standby Power Systems; 2013.

J. UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids; Current Edition, Including All Revisions.

K. UL 2085 - Protected Aboveground Tanks for Flammable and Combustible Liquids; Current Edition, Including All Revisions.

L. UL 2200 - Stationary Engine Generator Assemblies; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.

a. Transfer Switches: See Section 26 36 00.

2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.

3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.

1. Include generator set sound level test data.

2. Include characteristic trip curves for overcurrent protective devices upon request.

3. Include alternator thermal damage curve upon request.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

D. Derating Calculations: Indicate ratings adjusted for applicable service conditions.

E. Fuel Storage Tank Calculations: Indicate maximum running time for generator set configuration provided.

F. Specimen Warranty: Submit sample of manufacturer's warranty.

G. Evidence of qualifications for installer.

H. Evidence of qualifications for maintenance contractor (if different entity from installer).

I. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

J. Manufacturer's factory emissions certification.

K. Manufacturer's certification that products meet or exceed specified requirements.

L. Source quality control test reports.

M. Provide NFPA 110 required documentation from manufacturer where requested by authorities having jurisdiction, including but not limited to:

1. Certified prototype tests.
2. Torsional vibration compatibility certification.
3. NFPA 110 compliance certification.
4. Certified rated load test at rated power factor.

N. Manufacturer’s detailed field testing procedures.

O. Field quality control test reports.

P. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

Q. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

R. Maintenance contracts.

S. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

T. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Fuses: One of each type and size.
3. Extra Filter Elements: One of each type, including fuel, oil and air.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70 (National Electrical Code).
2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for Level 1 system.
3. NFPA 99 (Health Care Facilities Code).

4. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).

5. NFPA 30 (Flammable and Combustible Liquids Code).

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1. Authorized service facilities located within 200 miles of project site.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with engine generator systems of similar size, type, and complexity; manufacturer's authorized installer.

E. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Packaged Engine Generator Set - Basis of Design: Cummins.

B. Packaged Engine Generator Set- Other Acceptable Manufacturers:

1. Caterpillar Inc: www.cat.com/#sle.

C. Substitutions: Not Permitted.

D. Source Limitations: Furnish engine generator sets and associated components and accessories produced by a single manufacturer and obtained from a single supplier.

2.2 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. System Description:

1. Application: Emergency/standby.

2. Configuration: Single packaged engine generator set operated independently (not in parallel).

3. Total System Power Rating: As indicated on drawings, standby.

D. Packaged Engine Generator Set:

1. Type: Diesel (compression ignition).

2. Power Rating: As indicated on drawings, standby.

3. Voltage: As indicated on drawings.

4. Main Line Circuit Breaker:

a. Type: Thermal magnetic.

b. Trip Rating: Select according to generator set rating.

c. Features:

1) Shunt trip.

2) Auxiliary contacts.

E. Generator Set General Requirements:

1. Prototype tested in accordance with NFPA 110 for Level 1 systems.

2. Factory-assembled, with components mounted on suitable base.

3. List and label engine generator assembly as complying with UL 2200.

4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.

5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.

6. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.

F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.

1. Altitude: _____ feet.

2. Ambient Temperature: Between _____ and 104 degrees F.

3. Available Natural Gas Pressure: _____ inches water column.

G. Starting and Load Acceptance Requirements:

1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.

2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.

3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).

4. Maximum Load Step: Supports 100 percent of rated load in one step.

   a. Maximum Voltage Deviation with Load Step: _____ percent.

   b. Maximum Frequency Deviation with Load Step: _____ percent.

5. Motor Starting Capability: Supports starting of motor load indicated with a maximum voltage dip of _____ percent.

H. Exhaust Emissions Requirements:

1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.

2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

I. Interface with PLC.

2.3 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.

B. Engine Fuel System - Diesel (Compression Ignition):

1. Fuel Source: Diesel, ASTM D975 No. 2-D or approved cold weather diesel blends.

2. Fuel Storage: Sub-base fuel tank.

3. Engine Fuel Supply: Provide engine-driven, positive displacement fuel pump with replaceable fuel filter(s), water separator, check valve to secure prime, manual fuel priming pump, and relief-bypass valve. Provide fuel cooler where recommended by manufacturer.

4. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.

5. Main Fuel Tank (Bulk Tank): Comply with Section 23 11 13.

6. Day Tank:

    a. Provide separately mounted double-wall day tank with secondary containment, with fuel transfer pump(s), valves, and automatic controls suitable for operation in the configuration to be installed; listed and labeled as complying with UL 142.

    b. Tank Capacity: _____ gal.

    c. Tank Capacity: Size for minimum of 4 hours of continuous engine generator operation at 100 percent rated load, but not larger than permissible by applicable codes; account for fuel returned to main fuel tank (bulk tank), if applicable; account for heating where engine fuel is returned to day tank without fuel cooler.

    d. Alarm Indications/Shutdowns:

        1) Low fuel level alarm; provides local indication and activates remote output contact.

        2) Critical low fuel level alarm; provides local indication and activates remote output contact; can be configured to shut down engine to prevent loss of fuel prime.

        3) High fuel level; provides local indication and activates remote output contact.

        4) Critical high fuel level alarm; provides local indication and activates remote output contact; shuts down fuel transfer supply pump.

        5) Secondary containment leak detection alarm; provides local indication and activates remote output contact; shuts down fuel transfer supply pump.

        6) _____.

    e. Features:

        1) Direct reading fuel level gauge.

        2) Normal atmospheric vent.

        3) Emergency pressure relief vent.

7. Sub-Base Fuel Tank:

a. Provide sub-base mounted, double-wall fuel tank with secondary containment; listed and labeled as complying with UL 142.

b. Tank Capacity: Size for minimum of 24 hours of continuous engine generator operation at 100 percent rated load, but not larger than permissible by applicable codes.

c. Features:

1) Direct reading fuel level gauge.

2) Normal atmospheric vent.

3) Emergency pressure relief vent.

4) Fuel fill opening with lockable cap.

5) Dedicated electrical conduit stub-up area.

6) Low fuel level switch.

7) Leak detection switch; located within secondary containment interstitial space for detection of primary tank fuel leak.

C. Engine Fuel System - Gaseous (Spark Ignition):

1. Fuel Source: Natural gas.

2. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.

3. Provide components/features indicated and as necessary for operation and/or required by applicable codes, including but not limited to:

a. Carburetor.

b. Gas pressure regulators.

c. Fuel shutoff control valves.

d. Low gas pressure switches.

e. Vaporizer (for propane liquid withdrawal).

D. Engine Starting System:

1. System Type: Electric, with DC solenoid-activated starting motor(s).

2. Battery(s):

    a. Battery Type: Lead-acid.

    b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.

    c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.

3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.

4. Battery Charger:

    a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.

    b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.

    c. Recognized as complying with UL 1236.

    d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.

    e. Provide integral DC output ammeter and voltmeter with five percent accuracy.

    f. Provide alarm output contacts as necessary for alarm indications.

5. Battery Heater: Provide thermostatically controlled battery heater to improve starting under cold ambient conditions.

E. Engine Speed Control System (Governor):

1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.

2. Generator Sets Used with Closed Transition Transfer Switches: Provide electronic isochronous governor with frequency regulation suitable for transfer.

3. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

F. Engine Lubrication System:

1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.

2. Oil Heater: Provide thermostatically controlled oil heater to improve starting under cold ambient conditions.

G. Engine Cooling System:

1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.

2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.

3. Ducted Radiators: Where ducted radiator air discharge is to be field-installed, provide suitable radiator duct flange/adapter.

4. Coolant Heater: Provide thermostatically controlled coolant heater to improve starting under cold ambient conditions; size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature.

H. Engine Air Intake and Exhaust System:

1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.

2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.

3. Exhaust Silencer: Provide critical grade or better exhaust silencer with sound attenuation not less than basis of design; select according to manufacturer's recommendations to meet sound performance requirements, where specified.

2.4 ALTERNATOR (GENERATOR)

A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 00001; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.

B. Exciter:

1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.

2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.

3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.

4. Voltage Regulation (with shunt or PMG excitation): Plus/minus two percent for any constant load from no load to full load.

C. Temperature Rise: Comply with UL 2200.

D. Insulation System: NEMA MG 00001, Class H; suitable for alternator temperature rise.

E. Enclosure: NEMA MG 00001, drip-proof.

F. Total Harmonic Distortion: Not greater than five percent.

G. Alternator Heater: Provide strip heater to prevent moisture condensation on alternator windings.

2.5 GENERATOR SET CONTROL SYSTEM

A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.

B. Control Panel:

1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.

2. Generator Set Control Functions:

a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).

b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.

c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.

d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.

e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.

f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).

g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.

3. Generator Set Status Indications:

a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.

b. Current (Amps): For each phase.

c. Frequency (Hz).

d. Real power (W/kW).

e. Reactive power (VAR/kVAR).

f. Apparent power (VA/kVA).

g. Power factor.

h. Duty Level: Actual load as percentage of rated power.

i. Engine speed (RPM).

j. Battery voltage (Volts DC).

k. Engine oil pressure.

l. Engine coolant temperature.

m. Engine run time.

n. Generator powering load (position signal from transfer switch).

4. Generator Set Protection and Warning/Shutdown Indications:

   a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:

      1) Overcrank (shutdown).

      2) Low coolant temperature (warning).

      3) High coolant temperature (warning).

      4) High coolant temperature (shutdown).

      5) Low oil pressure (warning).

      6) Low oil pressure (shutdown).

      7) Overspeed (shutdown).

      8) Low fuel level (warning).

      9) Low coolant level (warning/shutdown).

      10) Generator control not in automatic mode (warning).

      11) High battery voltage (warning).

      12) Low cranking voltage (warning).

      13) Low battery voltage (warning).

      14) Battery charger failure (warning).

   b. In addition to NFPA 110 requirements, provide the following protections/indications:

      1) High AC voltage (shutdown).

      2) Low AC voltage (shutdown).

      3) High frequency (shutdown).

      4) Low frequency (shutdown).

      5) Overcurrent (shutdown).

6) Fuel tank leak (warning), where applicable.

c. Provide contacts for local and remote common alarm.

d. Provide lamp test function that illuminates all indicator lamps.

5. Other Control Panel Features:

a. Event log.

b. Communications Capability: Compatible with system indicated. Provide all accessories necessary for proper interface.

c. Remote monitoring capability via PC.

C. Remote Annunciator:

1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.

2. Generator Set Status Indications:

a. Generator powering load (via position signal from transfer switch).

b. Communication functional.

3. Generator Set Warning/Shutdown Indications:

a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following indications:

1) Overcrank (shutdown).

2) Low coolant temperature (warning).

3) High coolant temperature (warning).

4) High coolant temperature (shutdown).

5) Low oil pressure (warning).

6) Low oil pressure (shutdown).

7) Overspeed (shutdown).

8) Low fuel level (warning).

9) Low coolant level (warning/shutdown).

10) Generator control not in automatic mode (warning).

11) High battery voltage (warning).

12) Low cranking voltage (warning).

13) Low battery voltage (warning).

14) Battery charger failure (warning).

b. Provide audible alarm with silence function.

c. Provide lamp test function that illuminates all indicator lamps.

D. Remote Emergency Stop: Provide approved red, mushroom style remote emergency stop button where indicated or required by authorities having jurisdiction.

2.6 GENERATOR SET ENCLOSURE

A. Enclosure Type: Sound attenuating, weather protective.

B. Enclosure Material: Steel or aluminum.

C. Hardware Material: Stainless steel.

D. Color: Manufacturer's standard.

E. Access Doors: Lockable, with all locks keyed alike.

F. Openings: Designed to prevent bird/rodent entry.

G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.

H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.

I. Exhaust Silencers: Where exhaust silencers are mounted within enclosure in main engine compartment, insulate silencer to minimize heat dissipation as necessary for operation at rated load under worst case ambient temperature.

J. Enclosure Space Heater: Provide thermostatically controlled enclosure space heater to prevent condensation and improve starting under cold ambient conditions; size

according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature.

2.7 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

C. Generator Set production testing to include, at a minimum:

1. Operation at rated load and rated power factor.

2. Single step load pick-up.

3. Transient and steady state voltage and frequency performance.

4. Operation of safety shutdowns.

D. Diesel Fuel Storage Tanks: Perform pressurized leak test prior to shipment.

PART 3 EXECUTION

3.1 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Unless otherwise indicated, mount generator set on properly sized, minimum 6 inch high concrete pad constructed in accordance with Section 03 30 00.

F. Provide required support and attachment in accordance with Section 26 05 29.

G. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.

H. Provide diesel fuel piping and venting in accordance with Section 23 11 13, where not factory installed.

I. Install day tank in accordance with Section 23 11 13.

J. Provide natural gas piping in accordance with Section 23 11 23.

K. Provide duct for cooling air intake/exhaust in accordance with Section 23 31 00.

L. Provide engine exhaust piping in accordance with Section 23 51 00, where not factory installed.

1. Include piping expansion joints, piping insulation, thimble, condensation trap/drain, rain cap, hangers/supports, etc. as indicated or as required.

2. Do not exceed manufacturer's maximum back pressure requirements.

M. Install exhaust silencer in accordance with Section 23 51 00, where not factory installed.

N. Provide grounding and bonding in accordance with Section 26 05 26.

O. Identify system wiring and components in accordance with Section 26 05 53.

3.2 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

C. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

D. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.

E. Preliminary inspection and testing to include, at a minimum:

1. Inspect each system component for damage and defects.

2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.

3. Check for proper oil and coolant levels.

F. Prepare and start system in accordance with manufacturer's instructions.

G. Perform acceptance test in accordance with NFPA 110.

H. Inspection and testing to include, at a minimum:

1. Verify compliance with starting and load acceptance requirements.

2. Verify voltage and frequency; make required adjustments as necessary.

3. Verify phase sequence.

4. Verify control system operation, including safety shutdowns.

5. Verify operation of auxiliary equipment and accessories (e.g. battery charger, heaters, etc.).

6. Perform load tests in accordance with NFPA 110 (1.5 hour building load test followed by 2 hour full load test).

I. Provide field emissions testing where necessary for certification.

J. Sound Level Tests: Measure sound levels for compliance with specified requirements. Identify and report ambient noise conditions.

K. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

L. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.3 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.4 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

C. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of four hours of training.

3. Location: At project site.

D. After successful acceptance test and just prior to Substantial Completion, replace air, oil, and fuel filters and fill fuel storage tank.

3.5 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

3.6 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of engine generator system for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

C. Conduct site visit at least once every three months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.

D. Provide trouble call-back service upon notification by Owner:

1. Provide on-site response within 4 hours of notification.

2. Include allowance for call-back service during normal working hours at no extra cost to Owner.

3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

E. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

END OF SECTION 26 32 13

DIVISION 26 - ELECTRICAL
SECTION 26 36 00 - TRANSFER SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:

1. Automatic transfer switches.

2. Includes service entrance rated transfer switches.

3. Remote annunciators.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 05 73 - Power System Studies: Additional criteria for the selection of equipment specified in this section.

F. Section 26 32 13 - Engine Generators: For interface with transfer switches.

1. Includes code requirements applicable to work of this section.

2. Includes additional testing requirements.

3. Includes related demonstration and training requirements.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NEMA IA 10042-1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment; 2025.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 99 - Health Care Facilities Code; 2021, with Amendment.

G. NFPA 110 - Standard for Emergency and Standby Power Systems; 2013.

H. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

I. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.

a. Engine Generators: See Section 26 32 13.

2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.

3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Coordinate the work with placement of supports, anchors, etc. required for mounting.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.

1. Where applicable, include characteristic trip curves for overcurrent protective devices upon request.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

1. Clearly indicate whether proposed short circuit current ratings are based on testing with specific overcurrent protective devices or time durations; indicate short-time ratings where applicable.

D. Specimen Warranty: Submit sample of manufacturer's warranty.

E. Evidence of qualifications for installer.

F. Evidence of qualifications for maintenance contractor (if different entity from installer).

G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

H. Manufacturer's certification that products meet or exceed specified requirements.

I. Source quality control test reports.

J. Manufacturer’s detailed field testing procedures.

K. Field quality control test reports.

L. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

M. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

N. Maintenance contracts.

O. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

P. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70 (National Electrical Code).

2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for Level 2 system.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1. Authorized service facilities located within 200 miles of project site.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with power transfer systems of similar size, type, and complexity; manufacturer's authorized installer.

E. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

1. Contract maintenance office located within 200 miles of project site.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum five year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Transfer Switches:

1. Same as manufacturer of engine generator(s) used for this project.

B. Substitutions: See Section 01 60 00 - Product Requirements.

C. Source Limitations: Furnish transfer switches and accessories produced by a single manufacturer and obtained from a single supplier.

2.2 TRANSFER SWITCHES

A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Applications:

1. Utilize open transition transfer unless otherwise indicated or required.

2. Neutral Switching (Single Phase, Three Wire and Three Phase, Four Wire Systems):

a. Unless otherwise indicated or required, provide solid (unswitched) neutral.

3. Provide signal before transfer contacts.

D. Construction Type: Only "contactor type" (open contact) transfer switches are acceptable. Do not use "breaker type" (enclosed contact) transfer switches.

E. Automatic Transfer Switch:

1. Transfer Switch Type: Service entrance rated automatic transfer switch.

2. Transition Configuration: Delayed-transition (with neutral position).

3. Voltage: _____.

4. Ampere Rating: _____.

5. Neutral Configuration: solid neutral.

6. Load Served: As indicated on the drawings.

7. Primary Source: Utility (fed from _____).

8. Alternate Source: Engine generator (fed from _____).

F. Comply with NEMA IA 10042-1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).

G. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.

H. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.

I. Switching Methods:

1. Delayed Transition:

a. Provide break-before-make transfer with programmable time delay in a neutral position not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.

2. Obtain control power for transfer operation from line side of source to which the load is to be transferred.

J. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.

K. Enclosures:

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 12.

2. Finish: Manufacturer's standard unless otherwise indicated.

L. Short Circuit Current Rating:

1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

2. Short Time Rating: Where the requirement for selectivity is indicated, provide transfer switches with short time ratings suitable for the maximum short time delay setting of the supply side overcurrent protective device.

M. Automatic Transfer Switches:

1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.

2. Control Functions:

a. Automatic mode.

b. Test Mode: Simulates failure of primary/normal source.

c. Voltage and Frequency Sensing:

1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.

2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.

3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.

d. Outputs:

1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).

2) Auxiliary contacts; one set(s) for each switch position.

3) Signal before transfer (load disconnect) contacts; for selective load disconnection prior to transfer.

e. Adjustable Time Delays:

1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.

2) Transfer to alternate/emergency source time delay.

3) Retransfer to primary/normal source time delay.

4) Signal before transfer (load disconnect) contact time delay.

5) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.

f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.

g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.

h. Retransfer to Normal Switch: Bypasses time delays for retransfer to primary/normal source.

3. Status Indications:

a. Connected to alternate/emergency source.

b. Connected to primary/normal source.

c. Alternate/emergency source available.

d. Primary/normal source available.

4. Other Features:

a. Event log.

5. Automatic Sequence of Operations:

a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.

b. Where applicable, initiate signal before transfer (load disconnect) contacts at programmable time before transfer.

c. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.

d. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.

e. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

N. Service Entrance Rated Transfer Switches:

1. Furnished with integral disconnecting and overcurrent protective device on the primary/normal source and with ground-fault protection where indicated.

2. Listed and labeled as suitable for use as service equipment according to UL 869A.

O. Remote Annunciators:

1. Transfer Switch Status Indications:

a. Connected to alternate/emergency source.

b. Connected to primary/normal source.

c. Alternate/emergency source available.

d. Primary/normal source available.

P. Interface with Other Work:

1. Interface with engine generators as specified in Section 26 32 13.

2.3 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Perform production tests on transfer switches at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive transfer switches.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install transfer switches plumb and level.

F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.

G. Provide grounding and bonding in accordance with Section 26 05 26.

H. Identify transfer switches and associated system wiring in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Prepare and start system in accordance with manufacturer's instructions.

D. Automatic Transfer Switches:

1. Inspect and test in accordance with NETA ATS, except Section 4.

2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.

E. Provide additional inspection and testing as required for completion of associated engine generator testing as specified in Section 26 32 13.

F. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

G. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.4 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.5 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of transfer switches to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of transfer switches.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of four hours of training.

3. Instructor: Manufacturer's authorized representative.

4. Location: At project site.

E. Coordinate with related generator demonstration and training as specified in Section 26 32 13.

3.6 PROTECTION

A. Protect installed transfer switches from subsequent construction operations.

3.7 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of transfer switches for 5 years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

C. Conduct site visit at least once every three months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.

D. Provide trouble call-back service upon notification by Owner:

1. Provide on-site response within 4 hours of notification.

2. Include allowance for call-back service during normal working hours at no extra cost to Owner.

3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

E. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

END OF SECTION 26 36 00

DIVISION 26 - ELECTRICAL
SECTION 26 43 00 - SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surge protective devices for service entrance locations.

B. Surge protective devices for distribution locations.

C. Surge protective devices for branch panelboard locations.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 23 00 - Low-Voltage Switchgear.

C. Section 26 24 13 - Switchboards.

D. Section 26 24 16 - Panelboards.

1.3 ABBREVIATIONS AND ACRONYMS

A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.

B. SPD: Surge Protective Device.

1.4 REFERENCE STANDARDS

A. MIL-STD-220 - Method of Insertion Loss Measurement; 2009c (Validated 2019).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 1283 - Standard for Electromagnetic Interference Filters; Current Edition, Including All Revisions.

G. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to ordering equipment.

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

1. SPDs with EMI/RFI filter: Include noise attenuation performance.

C. Shop Drawings: Include wiring diagrams showing all factory and field connections with wire and circuit breaker/fuse sizes.

D. Certificates: Manufacturer's documentation of listing for compliance with the following standards:

1. UL 1449.

2. UL 1283 (for Type 2 SPDs).

E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data: Include information on status indicators and recommended maintenance procedures and intervals.

H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

I. Project Record Documents: Record actual connections and locations of surge protective devices.

1.7 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.9 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

C. Exclude surge protective devices from any clause limiting warranty responsibility for acts of nature, including lightning, stated elsewhere.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Field-installed, Externally Mounted Surge Protective Devices- Other Acceptable Manufacturers:

1. ABB/GE: www.geindustrial.com/.

2. Current Technology; a brand of Thomas & Betts Power Solutions: www.tnbpowersolutions.com.

3. Schneider Electric; Square D Brand Surgelogic Products: www.surgelogic.com.

B. Factory-installed, Internally Mounted Surge Protective Devices:

1. Same as manufacturer of equipment containing surge protective device, to provide a complete listed assembly including SPD.

C. Substitutions: See Section 01 60 00 - Product Requirements.

D. Source Limitations: Furnish surge protective devices produced by a single manufacturer and obtained from a single supplier.

2.2 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mouonted SPDs.

C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:

1. Wye Systems: L-N, L-G, N-G, L-L.

E. UL 1449 Voltage Protection Ratings (VPRs):

1. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.

2. 480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 V for L-L mode.

F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

G. Enclosure Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

1. Indoor clean, dry locations: Type 1.

2. Outdoor locations: Type 3R.

H. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:

1. Provide surface-mounted SPD where mounted in non-public areas or adjacent to surface-mounted equipment.

2. Provide flush-mounted SPD where mounted in public areas or adjacent to flush-mounted equipment.

I. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.

1. Switchboards: See Section 26 24 13.

2. Panelboards: See Section 26 24 16.

2.3 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

A. Surge Protective Device - Basis of Design: Surge Suppression, LLC (SSI); Advantage Series; Model SSLB (100 kA/phase, Type 2, I-n = 20 kA); www.surgesuppression.com/#sle.

1. Voltage: As indicated on drawings.

2. Features: Discrete "all-mode" protection (10 modes for 3-phase wye circuits); component-level thermal fusing; internal circuit board-mounted overcurrent fusing; 200 kAIC SCCR; 25 year warranty.

3. Include the following options:

a. AC10 - Basic internal audible alarm with dry relay contacts.

b. AC11 - Advanced internal audible alarm with on, off, and test with dry relay contacts.

c. C - Form C dry relay contacts.

d. C1 - Form C dry relay contacts pre-wired.

e. LP - Remote LED indicators in individual NEMA 4X housings.

f. S6 - Surge counter with reset button.

g. D1 - NEMA 1, 2, 3, 3S, 4X, and 12 composite enclosure with integral non-fused disconnect switch, with external handle

B. Surge Protective Device:

1. Protection Circuits: Field-replaceable modular.

2. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.

3. Repetitive Surge Current Capacity: Not less than 5,000 impulses.

4. UL 1449 Nominal Discharge Current (I-n): 20 kA.

5. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.

6. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs (UL 1283 listing not available for Type 1 SPDs).

a. Noise Attenuation: Not less than 40 dB at 100 kHz using MIL-STD-220 insertion loss test method.

7. Diagnostics:

a. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.

b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

c. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.

2.4 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS

A. Surge Protective Device - Basis of Design: Surge Suppression, LLC (SSI); Advantage Series; Model SSLA (100 kA/phase, Type 2, I-n = 10 kA); www.surgesuppression.com/#sle.

1. Voltage: As indicated on drawings.

2. Features: Discrete "all-mode" protection (10 modes for 3-phase wye circuits); component-level thermal fusing; internal circuit board-mounted overcurrent fusing; 200 kAIC SCCR; 25 year warranty.

3. Include the following options:

   a. AC10 - Basic internal audible alarm with dry relay contacts.

   b. AC11 - Advanced internal audible alarm with on, off, and test with dry relay contacts.

   c. C - Form C dry relay contacts.

   d. C1 - Form C dry relay contacts pre-wired.

   e. LP - Remote LED indicators in individual NEMA 4X housings.

   f. S6 - Surge counter with reset button.

   g. D1 - NEMA 1, 2, 3, 3S, 4X, and 12 composite enclosure with integral non-fused disconnect switch, with external handle

B. Surge Protective Device:

1. Protection Circuits: Field-replaceable modular.

2. Surge Current Rating: Not less than 80 kA per mode/160 kA per phase.

3. Repetitive Surge Current Capacity: Not less than 3,500 impulses.

4. UL 1449 Nominal Discharge Current (I-n): 20 kA.

5. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.

6. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs (UL 1283 listing not available for Type 1 SPDs).

   a. Noise Attenuation: Not less than 40 dB at 100 kHz using MIL-STD-220 insertion loss test method.

7. Diagnostics:

   a. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.

b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

c. Remote Status Monitoring: Provide Form C dry type contacts (normally open and normally closed) for remote annunciation of status.

d. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.

2.5 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS

A. Surge Protective Device - Basis of Design: Surge Suppression, LLC (SSI); Advantage Series; Model SSLA (100 kA/phase, Type 2, I-n = 10 kA); www.surgesuppression.com/#sle.

1. Voltage: As indicated on drawings.

2. Features: Discrete "all-mode" protection (10 modes for 3-phase wye circuits); component-level thermal fusing; internal circuit board-mounted overcurrent fusing; 200 kAIC SCCR; 25 year warranty.

3. Include the following options:

a. AC11 - Advanced internal audible alarm with on, off, and test with dry relay contacts.

b. C - Form C dry relay contacts.

c. C1 - Form C dry relay contacts pre-wired.

d. LP - Remote LED indicators in individual NEMA 4X housings.

e. S6 - Surge counter with reset button.

f. D1 - NEMA 1, 2, 3, 3S, 4X, and 12 composite enclosure with integral non-fused disconnect switch, with external handle

B. Surge Protective Device:

1. Protection Circuits: Field-replaceable modular.

2. Surge Current Rating: Not less than 60 kA per mode/120 kA per phase.

3. Repetitive Surge Current Capacity: Not less than 2,000 impulses.

4. UL 1449 Nominal Discharge Current (I-n): 20 kA.

5. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.

6. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs (UL 1283 listing not available for Type 1 SPDs).

    a. Noise Attenuation: Not less than 40 dB at 100 kHz using MIL-STD-220 insertion loss test method.

7. Diagnostics:

    a. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.

    b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

    c. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify that electrical equipment is ready to accept connection of the SPD and that installed overcurrent device is consistent with requirements of drawings and manufacturer's instructions.

D. Verify system grounding and bonding is in accordance with Section 26 05 26, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Unless indicated otherwise, connect service entrance surge protective device on load side of service disconnect main overcurrent device.

E. Provide conductors with minimum ampacity as required by NFPA 70, as required by NFPA 70, and as required by NFPA 70.

F. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.

G. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 05 26 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

H. Disconnect SPD prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPD connected.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS Section 7.19.1.

D. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

3.4 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 43 00

DIVISION 26 - ELECTRICAL
SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Drivers.

E. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

B. Section 26 05 33.16 - BOXES.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 09 18 - Remote Control Switching Devices: Remote controls for lighting, including network lighting controls, programmable relay panels, and remote control switching relays.

E. Section 26 09 23 - Lighting Control Devices.

F. Section 26 27 26 - Wiring Devices: Manual wall switches and wall dimmers.

G. Section 26 56 00 - Exterior Lighting.

1.3 REFERENCE STANDARDS

A. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

B. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.

C. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

D. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.

G. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

H. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2020.

I. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012 (Reaffirmed 2018).

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

M. UL 1598 - Luminaires; Current Edition, Including All Revisions.

N. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.

4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate dimensions and components for each luminaire.

2. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

b. Include IES LM-79 test report upon request.

2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.

3. LED's: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.

D. Samples:

1. Provide one sample(s) of each specified luminaire upon request.

2. Provide one sample(s) of each luminaire proposed for substitution upon request.

3. Provide one sample(s) of each product finish illustrating color and texture upon request.

E. Certificates for Dimming Drivers: Manufacturer's documentation of compatibility with dimming controls to be installed.

F. Field quality control reports.

G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

H. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.

3. Extra LED drivers: Ten percent of total quantily installed for each type of driver, but not less than two of each type..

J. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide 3-year manufacturer warranty for LED luminaires, including drivers.

C. Provide 5-year pro-rata warranty for batteries for emergency lighting units.

D. Provide 10-year pro-rata warranty for batteries for self-powered exit signs.

PART 2 PRODUCTS

2.1 MANUFACTURERS - LUMINAIRES

A. Furnish products from the Manurafactures listed in the Luminaire Schedule found on the drawings.

2.2 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: Proposed substitutions shall be made in electronic format using the proper form found in the front end documents and must be submitted to the Architect 10 business days prior to Bid..

2.3 LUMINAIRES

A. Manufacturers:

1. Acceptable Manufacturers for each type of luminaire are listed on the luminaire schedule on the drawings..

2. Substitutions: Proposed substitutions shall be made in electronic format using the proper form found in the front end documents and must be submitted to the Architect 10 business days prior to Bid..

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Unless otherwise indicated, provide complete luminaires including LED's, reflectors, lenses, drivers, housings and other components required to position, energize and protect the light source and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

H. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.

2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.

I. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.

2. Tested in accordance with IES LM-79 and IES LM-80.

3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

4. Color Rendering Index (CRI): Not less than 80.

2.4 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single- or double-face as indicated or as required for installed location.

2. Directional Arrows: As indicated or as required for installed location.

B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.

C. Accessories:

1. Provide compatible accessory high impact polycarbonate vandal shieldsfor exit signs located in Gymnasiums and other area's of potential abuse.

2.5 DRIVERS

A. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.

2. Control Compatibility: Fully compatible with the dimming controls to be installed.

a. Wall Dimmers: See Section 26 27 26.

b. Daylighting Controls: See Section 26 09 23.

2.6 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install products in accordance with manufacturer's instructions.

D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

E. Provide required support and attachment in accordance with Section 26 05 29.

F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

G. Suspended Ceiling Mounted Luminaires:

1. Do not use ceiling tiles to bear weight of luminaires.

2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.

3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.

4. Secure pendant-mounted luminaires to building structure.

5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.

6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.

7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

H. Recessed Luminaires:

1. Install trims tight to mounting surface with no visible light leakage.

2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.

3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Install accessories furnished with each luminaire.

K. Bond products and metal accessories to branch circuit equipment grounding conductor.

L. Exit Signs:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

M. Install lamps in each luminaire.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.6 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

D. Just prior to Substantial Completion, replace all lamps that have failed.

3.8 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 26 51 00

DIVISION 26 - ELECTRICAL
SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior luminaires.

B. Drivers

C. Lamps.

D. Poles and accessories.

E. Luminaire accessories.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 33.16 - BOXES.

E. Section 26 27 26 - Wiring Devices: Receptacles for installation in poles.

F. Section 26 28 13 - Fuses.

G. Section 26 51 00 - Interior Lighting.

1.3 REFERENCE STANDARDS

A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals; 2013, with Editorial Revision (2022).

B. ANSI C82.4 - American National Standard for Lamp Ballasts - Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps; 2017, with Editorial Revision (2022).

C. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2023.

D. ANSI O5.1 - American National Standard for Wood Poles: Specifications and Dimensions; 2022.

E. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.

F. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.

G. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

H. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

I. IES RP-8 - Recommended Practice: Lighting Roadway and Parking Facilities; 2022.

J. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

K. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

L. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2020.

M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

N. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.

2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Provide photometric calculations where luminaires are proposed for substitution upon request.

2. Provide structural calculations for each pole proposed for substitution.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

b. Include IES LM-79 test report upon request.

2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.

3. Lamps: Include rated life and initial and mean lumen output.

4. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

D. Sustainable Design Documentation: Submit manufacturer's product data on rated lamp life, showing compliance with specified requirements.

E. Samples:

1. Provide one sample(s) of each specified luminaire upon request.

2. Provide one sample(s) of each luminaire proposed for substitution upon request.

3. Provide one sample of each product finish illustrating color and texture upon request.

F. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.

G. Field Quality Control Reports.

1. Include test report indicating measured illumination levels.

H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

I. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra LED drivers: Ten percent of total quantity installed for each type, but not less than two of each type.

3. Extra Fuses: Five percent of total quantity installed for each type, but not less than two of each type.

4. Touch-Up Paint: 2 gallons, to match color of pole finish.

K. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

C. Receive, handle, and store wood poles in accordance with ANSI O5.1.

1.8 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide 2-year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.1 MANUFACTURERS-LUMINAIRES

A. Furnish products as inidcated in the Luminaire Schedule found in the drawings.

2.2 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: Proposed substitutions shall be made in electronic format using the proper form found in the front end documents and must be submitted to the Architect 10 business days prior to Bid.

2.3 All Poles:

A. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.

B. Structural Design Criteria:

1. Comply with AASHTO LTS.

2. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.

3. Design Wind Speed: 100 miles per hour, with gust factor of 1.3.

4. Dead Load: Include weight of proposed luminaire(s) and associated supports and accessories.

C. Material: Aluminum, unless otherwise indicated.

1. Shape: Round tapered, unless otherwise indicated.

2. All Poles:

a. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.

b. Structural Design Criteria:

1) Comply with AASHTO LTS.

2) Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.

a) Design Wind Speed: 100 miles per hour, with gust factor of 1.3.

3) Dead Load: Include weight of proposed luminaire(s) and associated supports and accessories.

c. Material: Aluminum, unless otherwise indicated.

d. Shape: Round tapered, unless otherwise indicated.

e. Finish: Match luminaire finish, unless otherwise indicated.

f. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.

g. Unless otherwise indicated, provide with the following features/accessories:

1) Top cap.

2) Handhole, Manufacturers standard size.

3) Anchor bolts with leveling nuts or leveling shims.

4) Anchor base cover.

5) Provision for pole-mounted weatherproof GFI receptacle where indicated.

6) Brackets: Where indicated..

7) Hinged base.

8) Pole-top tenon, _____ inch.

9) _____.

10) Factory installed Vibration Dampner.

3. Metal Poles: Provide ground lug, accessible from handhole or transformer base.

a. Finish: Match luminaire finish, unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Pole-Mounted Luminaires:

1. Maintain the following minimum clearances:

a. Comply with IEEE C2.

2. Foundation-Mounted Poles:

a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 30 00.

1) Install anchor bolts plumb per template furnished by pole manufacturer.

2) Position conduits to enter pole shaft.

b. Install foundations plumb.

c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.

d. Tighten anchor bolt nuts to manufacturer's recommended torque.

e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.

f. Install anchor base covers or anchor bolt covers as indicated.

3. Grounding:

a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.

4. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

5. Install non-breakaway in-line fuse holders and fuses complying with Section 26 28 13 in pole handhole or transformer base for each ungrounded conductor.

6. Install weather resistant GFI duplex receptacle with weatherproof cover as specified in Section 26 27 26 in designated poles.

G. Install accessories furnished with each luminaire.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. Install lamps in each luminaire.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.6 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Just prior to Substantial Completion, replace all lamps that have failed.

3.8 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 26 56 00

DIVISION 27 - COMMUNICATIONS
SECTION 27 10 00 - STRUCTURED CABLING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Communications system design requirements.

B. Communications pathways.

C. Copper cable and terminations.

D. Fiber optic cable and interconnecting devices.

E. Communications equipment room fittings.

F. Communications outlets.

G. Communications grounding and bonding.

H. Communications identification.

1.2 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; Electronic Industries Alliance/Electrical Components Association; Revision E, 2005.

C. FM (AG) - FM Approval Guide; current edition.

D. ICEA S-83-596 - Indoor Optical Fiber Cables; Insulated Cable Engineers Association; 2011.

E. ICEA S-90-661 - Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cables (With or Without An Overall Shield) For Use in General Purpose and LAN Communications Wiring Systems Technical Requirements; 2012.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 2012.

H. TIA-492AAAA - Detail Specification for 62.5-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009b.

I. TIA-492AAAB - Detail Specification for 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009a.

J. TIA-492AAAC - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009b.

K. TIA-492AAAD - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; Telecommunications Industry Association; 2009.

L. TIA-492CAAA - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers; 1998 (R 2002).

M. TIA-492CAAB - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak; Telecommunications Industry Association; 2000 (R2005).

N. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant; Rev A, 2015.

O. TIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant; Rev C, 2015.

P. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2015.

Q. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).

R. TIA-568.3 - Optical Fiber Cabling and Components Standard; 2016d.

S. TIA-569 - Telecommunications Pathways and Spaces; 2015d, with Addendum (2016).

T. TIA-570 - Residential Telecommunications Infrastructure Standard; 2012c.

U. TIA-598 - Optical Fiber Cable Color Coding; 2014d.

V. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2017c.

W. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2015c, with Addendum (2017).

X. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

Y. UL 444 - Communications Cables; Current Edition, Including All Revisions.

Z. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

AA. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.

BB. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.

2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.

3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Arrange for Communications Service Provider to provide service.

C. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Communications Service Provider representative.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Sustainable Design Documentation: Submit manufacturer's product data on cable and cable insulation showing compliance with specified lead content requirements.

D. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

E. Evidence of qualifications for installer.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

G. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.

H. Field Test Reports.

I. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

1. Record actual locations of outlet boxes and distribution frames.

2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.

3. Identify distribution frames and equipment rooms by room number on drawings.

J. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.5 QUALITY ASSURANCE

A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

B. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.

C. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:

1. Employing a BICSI Registered Communications Distribution Designer (RCDD).

2. Supervisors and installers factory certified by manufacturers of products to be installed.

3. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

1.7 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.

1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).

2. Comply with Communications Service Provider requirements.

3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.

4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.

5. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. System Description:

1. Building Entrance Cable: By others.

2. Backbones - Within Building: Copper, ____ -pair.

3. Backbones - Between Buildings: Copper, ____ -pair.

4. Offices and Work Areas: Provide one voice outlet and one data outlet in each work area.

5. Provide additional outlets where indicated on drawings.

C. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.

1. For the entire campus there is one main distribution frame and for each building there is a building distribution frame (BDF) that functions as the main distribution frame (MDF) for that building.

2. Locate main distribution frame as indicated on the drawings.

3. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.

D. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.

1. Locate intermediate distribution frames as indicated on the drawings.

E. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.

F. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.2 PATHWAYS

A. Conduit: See section 27 05 33.13.

B. Cable Trays: See Section 26 05 36.

C. Underfloor Ducts: See Section 26 05 39.

D. Overhead Service Entrance: Weatherhead or service entrance fitting located on outside of building with galvanized rigid steel or intermediate metallic conduit running to entrance facility.

E. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40.

F. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

1. Products:

a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.

b. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 COPPER CABLE AND TERMINATIONS

A. Manufacturers:

1. CommScope; _____: www.commscope.com/#sle.

2. General Cable Technologies Corporation; _____: www.generalcable.com/#sle.

3. Siemon Company; _____: www.siemon.com/#sle.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Provide cables with lead content less than 300 parts per million.

C. Copper Backbone Cable:

1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2, ICEA S-90-661, and listed and labeled as complying with UL 444; arranged in 25-pair binder groups.

2. Cable Type: TIA-568.2 Category 3 UTP (unshielded twisted pair); 24 AWG.

3. Cable Capacity: Quantity of pairs as indicated on drawings.

4. Cable Applications:

a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.

b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.

5. Product(s):

D. Copper Horizontal Cable:

1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.

2. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.

3. Cable Type - Voice: TIA-568.2 Category 5e UTP (unshielded twisted pair); 24 AWG.

4. Cable Capacity: 4-pair.

5. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.

6. Cable Applications:

a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.

b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.

c. General Purpose Applications: Use listed NFPA 70 Type CM/CMG general purpose cable, Type CMR riser cable, or Type CMP plenum cable.

7. Cable Jacket Color - Voice and Data Cable: Blue.

8. Cable Jacket Color - Voice Cable: _____.

9. Product(s):

a. CommScope; SYSTIMAX Twisted Pair Cables; GigaSPEED XL Category 6 U/UTP Cable: www.commscope.com/#sle.

b. CommScope; Uniprise Twisted Pair Cables; CS34 Series Category 6 U/UTP Cable: www.commscope.com/#sle.

c. General Cable Technologies Corporation; GenSPEED Cables: www.generalcable.com/#sle.

E. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

F. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.

1. Performance: 500 mating cycles.

2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

3. Product(s):

a. CommScope; SYSTIMAX RJ45 Jacks; MGS400 Series Category 6 U/UTP Modular Jacks: www.commscope.com/#sle.

b. CommScope; Uniprise RJ45 Jacks; UNJ600 Series Category 6 U/UTP Modular Jacks: www.commscope.com/#sle.

G. Copper Patch Cords:

1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.

2. Patch Cords for Patch Panels:

a. Quantity: One for each pair of patch panel ports.

b. Length: _____ feet.

3. Patch Cords for Work Areas:

a. Quantity: One for each work area outlet port.

b. Length: _____ feet.

4. Product(s):

a. CommScope; SYSTIMAX Category 6 U/UTP Patch Cords: www.commscope.com/#sle.

b. CommScope; Uniprise Category 6 U/UTP Patch Cords: www.commscope.com/#sle.

2.4 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

A. Manufacturers:

1. CommScope; _____: www.commscope.com/#sle.

2. General Cable Technologies Corporation; _____: www.generalcable.com/#sle.

3. Siemon Company; _____: www.siemon.com/#sle.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Provide cables with lead content less than 300 parts per million.

C. Fiber Optic Backbone Cable:

1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.

2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.

3. Cable Capacity: Quantity of fibers as indicated on drawings.

4. Cable Applications:

a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.

b. Riser Applications: Use listed NFPA 70 Type OFNR riser cable or Type OFNP plenum cable.

5. Cable Jacket Color:

a. Laser-Optimized Multimode Fiber (OM3/OM4): Aqua.

b. Multimode Fiber (OM1/OM2): Orange.

c. Single-Mode Fiber (OS1/OS2): Yellow.

6. Product(s):

a. CommScope Fiber Optic Cables; TeraSpeed Zero Water Peak Single-Mode Fiber: www.commscope.com/#sle.

D. Fiber Optic Horizontal Cable:

1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.

2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.

3. Cable Capacity: 2-fiber.

4. Cable Applications: Use listed NFPA 70 Type OFNP plenum cable unless otherwise indicated.

5. Cable Applications:

   a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.

   b. Riser Applications: Use listed NFPA 70 Type OFNR riser cable or Type OFNP plenum cable.

   c. General Applications: Use listed NFPA 70 Type OFN/OFNG general purpose cable, Type OFNR riser cable, or Type OFNP plenum cable.

6. Cable Jacket Color:

   a. Laser-Optimized Multimode Fiber (OM3/OM4): Aqua.

   b. Multimode Fiber (OM1/OM2): Orange.

   c. Single-Mode Fiber (OS1/OS2): Yellow.

7. Product(s):

   a. CommScope Fiber Optic Cables; TeraSpeed Zero Water Peak Single-Mode Fiber: www.commscope.com/#sle.

E. Fiber Optic Interconnecting Devices:

1. Connector Type: Type LC.

2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.

3. Maximum Attenuation/Insertion Loss: 0.3 dB.

4. Product(s):

a. CommScope Fiber Optic Connectors; QWIK II-LC Fiber Connectors: www.commscope.com/#sle.

F. Fiber Optic Patch Cords:

1. Description: Factory-fabricated 2-fiber cable assemblies with suitable connectors at each end.

2. Patch Cords for Patch Panels:

a. Quantity: One for each pair of patch panel ports.

b. Length: _____ feet.

3. Patch Cords for Work Areas:

a. Quantity: One for each work area outlet port.

b. Length: _____ feet.

4. Product(s):

a. CommScope Fiber Optic Patch Cords; TeraSpeed Fiber Patch Cords: www.commscope.com/#sle.

2.5 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:

1. Manufacturers:

a. CommScope; _____: www.commscope.com/#sle.

b. Siemon Company; _____: www.siemon.com/#sle.

c. Substitutions: See Section 01 60 00 - Product Requirements.

2. Connector Blocks for Category 3 Cabling: Type 66 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.

3. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.

4. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.

    a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.

    b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.

    c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.

    d. Provide incoming cable strain relief and routing guides on back of panel.

5. Product(s):

    a. CommScope; SYSTIMAX Copper Panels; 360-IPR-1100-XX Series Patch Panels: www.commscope.com/#sle.

    b. CommScope; Uniprise Copper Panels; UNP-XX-DM Series Patch Panels: www.commscope.com/#sle.

B. Fiber Optic Cross-Connection Equipment:

1. Manufacturers:

    a. CommScope; _____: www.commscope.com/#sle.

    b. Siemon Company; _____: www.siemon.com/#sle.

    c. Substitutions: See Section 01 60 00 - Product Requirements.

2. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum.

    a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.

    b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.

    c. Provide incoming cable strain relief and routing guides on back of panel.

d. Provide rear cable management tray at least 8 inches deep with removable cover.

e. Provide dust covers for unused adapters.

3. Product(s):

a. CommScope; SYSTIMAX Fiber Panels; HD Series Patch Panels: www.commscope.com/#sle.

b. CommScope; Uniprise Fiber Panels; SD Series Patch Panels: www.commscope.com/#sle.

C. Backboards: Interior grade plywood without voids, 3/4 inch thick; UL-labeled fire-retardant.

1. Do not paint over UL label.

D. Equipment Frames, Racks and Cabinets:

1. Manufacturers:

a. CommScope; _____: www.commscope.com/#sle.

b. Siemon Company; _____: www.siemon.com/#sle.

c. Substitutions: See Section 01 60 00 - Product Requirements.

2. Component Racks: EIA/ECA-310 standard 19 inch wide.

3. Wall Mounted Racks: Steel construction, hinged to allow access to back of installed components.

4. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.

5. Freestanding Cabinets: Front and rear doors with locks; removable side panels with locks; vented top and rear door; adjustable leveling feet; cable access in roof and base; grounding bar.

6. Wall Mounted Cabinets: Front doors with locks, louvered side panels, top and bottom cable access, and ground lug.

7. Cabinets: Steel construction with corrosion resistant finish.

8. Locks: Keyed alike.

9. Product(s):

a. CommScope Two-Post Equipment Racks (Relay Racks) ; www.commscope.com/#sle.

b. _____.

E. Cable Management:

1. Manufacturers:

a. CommScope; _____: www.commscope.com/#sle.

b. Siemon Company; _____: www.siemon.com/#sle.

c. Substitutions: See Section 01 60 00 - Product Requirements.

2. Product(s):

a. CommScope Cable Runway: www.commscope.com/#sle.

b. CommScope Horizontal/Vertical Cable Managers; HCM-SS-XX-XX/VCM-DS-XX-XX Series: www.commscope.com/#sle.

c. CommScope FiberGuide Raceway: www.commscope.com/#sle.

2.6 COMMUNICATIONS OUTLETS

A. Manufacturers:

1. CommScope; _____: www.commscope.com/#sle.

2. Siemon Company; _____: www.siemon.com/#sle.

3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Outlet Boxes: Comply with Section 26 05 33.16.

1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.

2. Minimum Size, Unless Otherwise Indicated:

a. Voice Only Outlets: 4 inch by 2 inch by 2-1/8 inch deep (100 by 50 by 54 mm) trade size.

b. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.

c. Fiber Optic Outlets: 4-11/16 inch square by 2-1/8 inch deep (119 by 54 mm) trade size.

C. Wall Plates:

1. Comply with system design standards and UL 514C.

2. Accepts modular jacks/inserts.

3. Capacity:

a. Voice Only Outlets: _____ ports.

b. Data or Combination Voice/Data Outlets: _____ ports.

c. Fiber Optic Outlets: _____ simplex/ _____ duplex couplers.

4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 26 27 26.

5. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified on the drawings.

6. Wall Plate Material/Finish - Flush-Mounted Outlets: High impact thermoplastic, color to be selected.

7. Product(s):

a. CommScope Faceplates; M Series: www.commscope.com/#sle.

b. _____.

2.7 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607.

B. Comply with Section 26 05 26.

2.8 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

B. Comply with Section 26 05 53.

2.9 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Comply with latest editions and addenda of TIA-570, TIA-607, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

C. Comply with Communication Service Provider requirements.

D. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

E. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

3.2 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:

1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.

2. 12 inches from power conduits and cables and panelboards.

3. 5 inches from fluorescent and high frequency lighting fixtures.

4. 6 inches from flues, hot water pipes, and steam pipes.

B. Outlet Boxes:

1. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of telecommunications outlets provided under this section.

a. Mounting Heights: Unless otherwise indicated, as follows:

1) Telephone and Data Outlets: 18 inches above finished floor.

2) Telephone Outlets for Side-Reach Wall-Mounted Telephones: 54 inches above finished floor to top of telephone.

3) Telephone Outlets for Forward-Reach Wall-Mounted Telephones: 48 inches above finished floor to top of telephone.

4) _____.

b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

c. Provide minimum of 24 inches horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.

d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.

e. Locate outlet boxes so that wall plate does not span different building finishes.

f. Locate outlet boxes so that wall plate does not cross masonry joints.

g. _____.

3.3 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:

1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.

2. Do not over-cinch or crush cables.

3. Do not exceed manufacturer's recommended cable pull tension.

4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:

1. At Distribution Frames: 120 inches.

2. At Outlets - Copper: 12 inches.

3. At Outlets - Optical Fiber: 39 inches.

C. Copper Cabling:

1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.

2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.

3. Use T568B wiring configuration.

D. Fiber Optic Cabling:

1. Prepare for pulling by cutting outer jacket for 10 inches from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.

2. Support vertical cable at intervals as recommended by manufacturer.

E. Wall-Mounted Racks and Enclosures:

1. Install to plywood backboards only, unless otherwise indicated.

2. Mount so height of topmost panel does not exceed 78 inches above floor.

F. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.

G. Floor-Mounted Enclosures: Connect adjacent cabinets together and remove interior side panels.

H. Identification:

1. Use wire and cable markers to identify cables at each end.

2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.

3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:

1. Inspect cable jackets for certification markings.

2. Inspect cable terminations for color coded labels of proper type.

3. Inspect outlet plates and patch panels for complete labels.

4. Inspect patch cords for complete labels.

D. Testing - Copper Cabling and Associated Equipment:

1. Test backbone cables after termination but before cross-connection.

2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.

3. Test operation of shorting bars in connection blocks.

4. Category 3 Backbone: Perform attenuation test.

5. Category 3 Links: Test each pair for short circuit continuity, short to ground, crosses, reversed polarity, operational and ring-back, and dial tone.

6. Category 5e and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.

7. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.

E. Testing - Fiber Optic Cabling:

1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.

2. Multimode Backbone: Perform tests in accordance with TIA-526-14.

3. Single Mode Backbone: Perform tests in accordance with TIA-526-7.

4. Links: Perform optical fiber end-to-end attenuation tests and field reel tests.

F. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION 27 10 00

DIVISION 31 00 00 – EARTHWORK AND SITEWORK
SECTION 31 05 00 - EARTHWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Special Provisions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Preparing and grading subgrades for slabs-on-grade, walks, pavements, and landscaping.
2. Excavating and filling for buildings, structures, and basins.
3. Drainage and moisture-control fill course for slabs-on-grade.
4. Subbase course for walks and pavements.
5. Subsurface drainage backfill for walls and trenches.
6. Excavating and backfilling trenches within building lines.
7. Excavation Dewatering.
8. Excavation Support and Bracing.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Section 01 10 10 – Summary of Work Sequence.
2. Section 01 14 00 – General Coordination.
3. Section 01 33 00 – Submittals.
4. Section 02 32 00 – Subsurface Investigation.
5. Section 03 30 00 - Cast-in-Place Concrete.
6. Section 22 13 13 – Exterior Piping, Valves, Fittings and Accessories.
7. Section 31 10 00 – Site Clearing.
8. Section 31 23 00 – Dewatering and Drainage.
9. Section 32 11 23 - Aggregate Base Course.
10. Section 32 11 24 – Aggregate Surface Course.
11. Section 32 12 16 – Bituminous Concrete Paving.
12. Section 32 13 13 - Portland Cement Concrete Paving.
13. Section 32 31 00 – Chain-Link Fences and Gates.

1.3 DEFINITIONS

A. Excavation: The removal of material encountered to subgrade elevations and the reuse or disposal of materials removed.

B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.

D. Aggregate Base Course: The layer placed between the subbase and surface pavement in a paving system.

E. Drainage Fill: Course washed granular material supporting slab-on-grade or adjacent to structures placed to collect and direct capillary flow of water.

F. Unauthorized Excavation: The removing of materials beyond indicated subgrade elevations or dimensions without approval by the Engineer. Unauthorized excavation, as well as remedial work approved by the Engineer, shall be at the Contractor's expense.

G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

H. Utilities: Include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for the following:

1. Filter fabric.
2. Geotextile Ground Stabilization Fabric.
3. Controlled Low-Strength Material (Flowable Fill).

C. Samples of the following:

1. 20-lb. (9 kilograms) samples of each of the following proposed fill and backfill materials. Include source (address, phone, point of contact), material designation and gradation and classification test certification to Illinois Department of Transportation specifications.

a. bedding material: subbase or base material.
b. drainage fill.
c. filtering material.

D. Excavation Support and Bracing System Structural Design (per 3.6 below).

E. Execution Plan and Schedule for construction of Lagoon Clay Liner. Coordinate with Engineer for compaction and hydraulic conductivity testing.

F. Operation and Maintenance Manual: The Manufacturer shall submit two (2) complete copies of an Operation and Maintenance Manual compliant with Specification Section 013300.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Comply with requirements of the following specifications as modified herein.

1. Illinois Department of Transportation, latest edition.

a. Standard Specifications for Road and Bridge Construction.
b. Supplemental Specifications and Recurring Special Provisions.
c. References to sections on measurement and basis of payment shall not apply.

2. Engage a qualified professional engineer, registered in Illinois, to prepare or supervise the preparation of drawings or comprehensive engineering analyses and design as required for excavation support and bracing required for the proposed work.

B. Testing and Inspection Service: the Contractor shall employ a qualified and independent engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing including backfill compaction testing. Comply with Section 013300 – Submittals. Submit all testing agency reports and verifications, test results and reports prior to the work.

1.6 PROJECT CONDITIONS

A. Coordinate with other work.

B. Protect and maintain existing utilities.

1. Joint Utility Location Information for Excavators: Contractor shall call the toll-free J.U.L.I.E. telephone number, 1-800-892-0123, before starting excavation off or adjoining the site property. Allow 48 hours for other than emergency assistance.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sub-base or Base Material: CA 6 or CA 10.

B. Backfill and Fill Materials: satisfactory soil materials or as indicated on the Plans.

C. Engineered Fill: Sub-base or base material.

D. Drainage Fill: CA 7 or as shown on the plans.

E. Geotextile Drainage Filter Fabric Material: Phillips 4NP Non-woven Polypropylene Geotextile (4.1 oz./sq. yd./.10 CM/S Permeability), or Equal.

F. Geotextile Ground Stabilization Fabric Material; DuPont TYPAR 3401 or equal.

G. Satisfactory Soil Materials: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP and SM; free of rock or gravel larger than 2 inches (50 mm) in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.

H. Unsatisfactory Soil Materials: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH and PT.

I. Topsoil: Friable, silty clay loam surface soil found in a depth of not less than 8-inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 2-inches in diameter, without weeds, roots and other objectionable material.

J. Controlled Low-Strength Material: Comply with Illinois Department of Transportation Standard Specifications for Road and Bridge Construction, adopted January 1, 1997, Special Provision for Controlled Low-Strength Material (CLSM), Recurring Special Provision Check Sheet #12. Sections on Basis of Payment shall not apply.

K. Structural Steel: ASTM A 36 (ASTM A 36M).

L. Steel Sheet Piling: ASTM A 328 (ASTM A 328M) or ASTM A 572 (ASTM A 572M)

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid-and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep.

1. Tape Colors: Provide tape colors to utilities as follows:
   a. Red: Electric.
   b. Yellow: Gas, oil, steam and dangerous materials.
   c. Orange: Telephone and other communications.
   d. Blue: Water systems.
   e. Green: Sewer systems.

PART 3 EXECUTION

3.1 PREPARATION

A. Protect existing structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

A. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

C. Provide excavation dewatering and drainage in all locations defined and recommended or required in the soils report in accordance with Specification Section 31 23 00 and requirements or codes noted in the soils report Section 02 32 00 as a base bid contract requirement.

3.3 CONSTRUCTION REQUIREMENTS

A. Construction shall be per the plans, the above referenced Specifications, and as modified below.

B. Provide over-excavation, backfill, compaction and materials, at all structures to the depths as defined in the soils report (Section 02 32 00) as a base bid contract requirement.

C. Provide excavation support and bracing at all structures as defined in the soils report (Section 02 32 00) to OSHA safety requirements for each structure site specific soil conditions as a base bid contract requirement.

D. Provide structure excavation and pipe trench dewatering at all locations in accordance with the soils report (Section 02 32 00) as a base bid contract requirement.

3.4 EXCAVATION

A. Explosives: Use of explosives will not be permitted.

B. Classified Excavation: Excavation is classified and includes excavation to required subgrade elevations. Excavation will be classified as earth excavation or rock excavation as follows:

1. Earth excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with soil and other materials encountered that are not classified as rock or unauthorized excavation.

a. Intermittent drilling or ripping to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.

2. Rock excavation includes removal and disposal of rock material and obstructions encountered which, in the opinion of the Engineer, require for its removal the continuous use of pneumatic tools.

a. Rock material includes boulders 1/2 cu. yd. (0.38 cu. meter) or more in volume and rock in beds, ledges, unstratified masses, and conglomerate

deposits.

b. The Contractor shall be required to demonstrate that the material cannot be removed "by hand pick" or by a power operated excavator or shovel of at least 3/4 cu. Yd. (0.57 cubic meter) capacity, which is in good working condition. No payment will be made for Rock Excavation unless air tools were used by the Contractor.

c. No payment will be made for Rock Excavation unless the Engineer approves such payment in writing in advance upon being satisfied that the material meets the above criteria.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 0.10 ft (30 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations from 6 in. to 12 in. (150 mm to 300 mm) above bottom of footing before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Appurtenances: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 0.10 ft (30 mm). Do not disturb bottom of excavations intended for bearing surface.

B. Provide over-excavation below structures to the additional depths below footing grade as defined and identified in the soils report as a base bid contract requirement.

3.6 EXCAVATION SUPPORT AND BRACING SYSTEM

A. Provide, monitor and maintain an anchored and braced excavation support and protection system capable of resisting soil and hydrostatic pressure and supporting sidewalls of excavations.

B. Drawings detailing the support system and structural calculations, both sealed by a Structural Engineer, shall be submitted for the project record prior to beginning excavation work on-site.

C. Refer to Section 02 32 00 – Subsurface Investigation for additional information requiring structural and pipeline excavation support and specific foundation and structural fill requirements.

3.7 APPROVAL OF SUBGRADE

A. Notify Engineer when excavations have reached required subgrade.

B. When Engineer determines that unforeseen unsatisfactory soil is present, excavate and replace with approved compacted backfill or fill material.

1. Unforeseen additional excavation and replacement material will be paid according to the Contract provisions for Extra Work.

C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as approved by the Engineer.

D. Test rolling of subgrade for parking lots, roads and streets.

1. The Contractor will provide, at his own expense, a loaded truck and test roll the compacted earth subgrade in the presence of the Engineer before any sub-base, base or surface material is placed. The truck shall be loaded as follows: 27,000 lbs (12,250 kilograms) on two axles and 45,000 lbs (20,400 kilograms) on three axles with a tolerance not to exceed 10%. The Contractor shall give the Engineer 48-hour notice prior to test rolling.

2. The truck shall make one pass over the entire subgrade area to be constructed. Any areas which show rutting, cracking or rolling of the compacted subgrade upon test rolling will not be accepted. The Contractor will recompact and/or reconstruct the section that fails and test roll again prior to acceptance.

3. Repairs and/or reconstruction of subgrade will be paid according to the contract provisions for Extra Work.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile excavated materials acceptable for final surface (topsoil), backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 BACKFILL

A. Backfill excavations promptly, but not before completing the following:

1. Acceptance of construction below finish grade including, where applicable, damp proofing, waterproofing, wall bracing and perimeter insulation.
2. Surveying locations of underground utilities for record documents.
3. Concrete formwork removal.
4. Removal of trash and debris from excavation.
5. Removal of temporary shoring and bracing, and sheeting.

B. Backfill areas to contours and elevations with unfrozen materials.

C. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

D. Employ a placement method that does not disturb or damage other work.

E. Backfill all areas of over-excavation below footing grade as defined and identified in the soils report with materials as defined in the soils report as a base bid requirement.

F. Maintain optimum moisture content of backfill materials to attain required compaction density. Do not backfill against unsupported foundation walls.

G. Backfill simultaneously on each side of foundation walls.

3.10 COMPACTION

A. Place backfill and fill materials in layers not more than 8 in. (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 in. (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations. Place backfill and fill uniformly along the full length of each structure.

C. Percentage of Maximum Dry Density Requirements: Compact soil in accordance with soils report (Section 02 32 00 – Subsurface Investigation). In lieu of a soils report, compact soil to not less than the following percentages of maximum dry density according to ASTM D 698: (standard)

1. Under structures, building slabs, steps, and pavements, compact the top 12 in. (300 mm) below subgrade and each layer of backfill or fill material at 98% maximum dry density.
2. Under walkways, compact the top 6 in. (150 mm) below subgrade and each layer of backfill or fill material at 95% maximum dry density.
3. Adjacent to structures, under lawn or unpaved areas, compact the top 6 in. (150 mm) below subgrade and each layer of backfill or fill material at 90% maximum dry density.

3.11 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between existing adjacent grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 0.10 ft (30 mm).
2. Walks: Plus or minus 0.10 ft (30 mm).
3. Pavements: Plus or minus 1/2 in. (13 mm).

3.12 DRAINAGE FILL

A. Under slabs-on-grade, place drainage fill course on prepared subgrade.

1. Compact drainage fill to required cross sections and thickness.
2. When compacted thickness of drainage fill is 6 in. (150 mm) or less, place materials in a single layer.
3. When compacted thickness of drainage fill exceeds 6 in. (150 mm) thick place materials in equal layers, with no layer more than 6 in. (150 mm) thick nor less than 3 in. (75 mm) thick when compacted.

3.13 FIELD QUALITY CONTROL

A. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements. Comply with Section 01 33 00 – Submittals. Submit all testing agency verifications, test results and reports.

3.14 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace material to depth approved by the Engineer; reshape and recompact at optimum moisture content to the required density.

C. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

D. Topsoil on the site shall be removed and temporarily stockpiled for replacement on the site at the finish grades and depths indicated. Where topsoil depth is not specifically called out on the plans, a minimum finished depth of 8 in. shall be provided in all areas.

3.15 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Transport surplus satisfactory soil to designated storage or stockpile areas on the Owner's Property up to the finished grades indicated on the plans and/or legally dispose of surplus soils off the Owner’s property. Any excess spoil material above and beyond the

finished grades indicated on the plans shall be legally disposed off the Owner’s property.

1. Remove waste material, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION 31 05 09

DIVISION 31 00 00 – EARTHWORK AND SITEWORK
SECTION 31 10 00 - SITE CLEARING

PART 1 GENERAL

1.1 GENERAL NOTES

A. Drawings and general provisions of Contract, including General Conditions, Special Provisions, and Division 1 Specification sections, apply to work of this section.

B. Furnish all labor, materials, services and equipment necessary to complete all site clearing shown on the drawings and specified herein.

1.2 SUMMARY

A. The extent of site clearing is defined to include, but is not limited to, the following:

1. Removal of trees, stumps and other vegetation.
2. Clearing and grubbing.
3. Removing existing above grade improvements.
4. Removing existing below grade improvements.

B. The Contractor shall be required to field-verify the extent of site clearing required for construction prior to bidding. The cost of site clearing shall be incidental to the cost of construction.

C. The following related items are specified in other sections of the specifications.

1. Excavating, grading and filling.

D. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 01 10 10 – Summary of Work Sequence.
2. Section 01 14 00 – Coordination.
3. Section 31 05 00 – Earthwork.
4. Section 32 91 00 – Landscape Grading.

1.3 QUALITY ASSURANCE

A. Codes and Standards: Comply with requirements of the following specifications as modified herein.

1. Illinois Department of Transportation, latest edition.

a. Standard Specifications for Road and Bridge Construction.
b. Supplemental Specifications and Recurring Special Provisions.

B. Testing and Inspection: District will provide engineering testing and inspection.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable local, state and federal regulations.

1.5 PROJECT CONDITIONS

A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, and adjacent property. Do not close or obstruct roads without permission from authorities having jurisdiction.

B. Protection of Existing Improvements: Provide protection necessary to prevent damage to existing improvements to remain.

C. Salvageable Improvements: The Owner shall remove salvable items from site prior to construction activities. The Owner shall also have first right of refusal on all items shown to be removed by the Contractor. All items not wanted by the Owner shall become the property of the contractor and shall become his responsibility to remove from the premises.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain.

C. Protect existing site improvements from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to the Owner.

3.2 UTILITIES

A. Existing Utilities: Do not interrupt existing utility improvements occupied by the Owner or others unless permitted or indicated on the Plans and then only after arranging to provide temporary utility services.

1. Restore damaged existing utilities to their original condition as acceptable to the Owner.

3.3 SITE CLEARING

A. General: Remove trees, shrubs, grass and other vegetation, improvements, or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off site disposing of stumps and roots.

1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner, where such roots and branches obstruct installation of new construction.

a. Where existing trees are indicated to remain, leave existing topsoil in place

within drip lines to prevent damage to root system.

B. Clearing and Grubbing: Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing.

1. Completely remove stumps, roots, and other debris protruding through ground surface.
2. Use only hand methods for grubbing inside drip line of trees indicated to remain.
3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

a. See Section 31 05 00 - Earthwork for placing fill materials and compaction requirements.

C. Removal of Improvements: Remove existing above grade and below grade improvements, structures, debris and facilities as indicated on the Plans and as necessary to facilitate new construction.

D. Use of explosives is prohibited.

3.4 DISPOSAL OF WASTE MATERIALS

A. Removal from Owner's Property: Remove waste materials and unsuitable soil from Owner's property.

END OF SECTION 31 10 00

DIVISION 31 - EARTHWORK
SECTION 31 22 13 – ROUGH GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removal of topsoil and subsoil.
B. Cutting, grading, filling and rough contouring the site.

1.2 RELATED SECTIONS

A. Related Sections in this specification includes but may not be limited to, the following:

1. Section 31 10 00 - Site Clearing
2. Section 31 23 16 - Excavation
3. Section 31 23 23 – Backfill
4. Section 32 05 13 - Soil Materials
5. Section 32 91 19 - Landscape Grading
6. Plan Sheet notes on structural foundations

1.3 REFERENCES

A. ASTM D698 - Standard Laboratory Density

B. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

C. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.4 SUBMITTALS

A. Material Sources: per Section 320513 for backfill material.

1.5 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of utilities remaining, by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil: As specified in Section 32 05 13.

B. Fill: As specified in Section 32 05 13. Fill not available at the site shall be obtained from a borrow site. The borrow sites shall be stripped of any topsoil to be replaced when the borrow site is complete. The borrow area shall be re-graded at completion to drain with surrounding area and fertilized and seeded when completed.

C. Structural Fill: as specified in Section 32 05 13.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions shown on plans.

B. Verify survey benchmark elevations.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.
B. Stake and flag locations of known utilities.
C. Locate, identify, and protect utilities that remain from damage.
D. Notify utility companies to remove and relocate utilities.
E. Protect above and below grade utilities that remain.
F. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
G. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 EXCAVATION

A. Excavate soil from areas to be further excavated, re-landscaped, or regraded.
B. Remove excess material from site, except topsoil. Topsoil shall be stockpiled at the site for future use by the Owner and not removed.

3.4 FILLING

A. Fill areas to contours and elevations with unfrozen materials.
B. Place fill materials on continuous layers and compact in accordance with Schedule at end of this Section.
C. Maintain optimum moisture content of fill materials to attain required compaction density.
D. Make grade changes gradual. Blend slope into level areas.
E. Remove surplus fill materials and surplus borrow materials from site, except topsoil materials as noted in Paragraph 3.3.B. above.

3.5 TOLERANCES

A. Top Surface of Subgrade: Plus, or minus 1/10 foot.

3.6 FIELD QUALITY CONTROL

A. Testing and Inspection: Contractor shall employ a qualified independent testing and inspecting agency to sample materials, perform tests, and submit reports for Engineer’s review.
B. Compaction testing will be performed in accordance with ASTM D698, ASTM D2922, and ASTM D3017.
C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.7 SCHEDULES

A. Structural fill to adjust grade or over-excavation:

1. Maximum lifts 6-inch loose depth.
2. Compact to minimum 98% of maximum dry density Standard Proctor.
3. As required by plan sheet notes.

B. Subsoil fill:

1. Maximum 8-inch loose depth.
2. Compact to minimum 95% of maximum dry density Standard Proctor.

C. Topsoil:

1. Minimum 8-inch loose depth.

END OF SECTION 31 22 13

DIVISION 31 – EARTHWORK AND SITEWORK
SECTION 31 23 00 – DEWATERING AND DRAINAGE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions, Special Provisions and Division 1 Specification Sections, apply to this Section

1.2 SUMMARY

A. Design, furnish, install, operate, monitor, maintain and remove a complete temporary dewatering system as necessary to lower and control water levels below subgrades of excavations to permit construction in the dry. Dewatering as necessary to prosecute the work is a base bid requirement and incidental to the base bid price.

B. Provide, maintain and remove temporary surface water control measures adequate to drain and remove surface water entering excavations.

C. Collect and properly dispose of all discharge water from the dewatering and drainage systems in accordance with all applicable environmental regulations/requirements and governmental authorities with jurisdiction on the project site and tributary properties or waterways.

D. Related Sections:

1. Section 01 10 10 – Summary of Work Sequence.
2. Section 01 14 00 – Coordination.
3. Section 01 33 00 – Submittals.
4. Section 02 32 00 – Subsurface Investigation.
5. Section 31 05 00 – Earthwork.
6. Section 31 10 00 – Site Clearing.

1.3 DESIGN AND PERFORMANCE RESPONSIBILITY

A. Design and execute methods for controlling surface water and groundwater.

B. Be solely responsible for damage to properties, buildings or structures, sewers and other utility installations, pavements and work that may result from Contractor's dewatering or surface water control operations.

C. Design review and field monitoring activities by Owner and Engineer shall not relieve the Contractor of responsibility for the work.

1.4 SUBMITTALS

A. Operation and Maintenance Manual: The Manufacturer shall submit two (2) complete copies of an Operation and Maintenance Manual compliant with Specification Section 01 33 00.

PART 2 PRODUCTS

2.1 MATERIALS

A. Pipe for observation wells, if required, shall consist of minimum 1 in. I.D. Schedule 40 PVC pipe and machine slotted PVC wellpoints, maximum slot 0.020 in.

PART 3 EXECUTION

3.1 GENERAL

A. Control surface water and groundwater such that excavation to final grade is made in-the-dry, the bearing soils are maintained undisturbed and softening and/or instability or disturbance due to the presence or seepage of water does not occur. All construction and backfilling shall proceed in-the-dry and flotation of completed portions of work shall be prohibited.

3.2 SURFACE WATER CONTROL

A. Construct surface water control measures, including dikes, ditches, sumps and other methods to prevent, as necessary, flow of surface water into excavations.

B. Provide Erosion Control Measures as necessary to prevent siltation run-off from the site due to the excavation dewatering activity.

3.3 EXCAVATION DEWATERING

A. Provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations. Excavations shall be kept dry, so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.

B. Pipe and concrete shall not be laid in water or submerged within 24 hours after being placed. Water shall not flow over new concrete within four days after placement.

C. In no event, shall water rise to cause unbalanced pressure on structures until the concrete or mortar has set at least 24 hours. Prevent floatation of the pipe by promptly placing backfill.

D. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed capacity of the subgrade soils at proposed bottom of excavation. If the subgrade of the trench bottom or excavation becomes disturbed due to inadequate drainage, excavate below normal grade and refill with screened CA7 gravel at the Contractor’s expense.

E. Evaluate the impact of the anticipated subsurface soil/water conditions on proposed method of excavation and removal of water.

F. Where groundwater level is above the proposed bottom of excavation level, it is expected that some type of pumped dewatering system will be required for pre-drainage of the soils prior to final excavation and for maintaining the lowered groundwater level until construction has been completed to such an extent that the structure, pipeline or fill will not be floated or otherwise damaged. It is further expected that the type of system, spacing of dewatering units and other details of the work will have to be varied depending on soil/water conditions at a particular location.

G. Dewater and excavate in a manner which does not cause loss of ground or disturbance to the pipe bearing soil or soil which supports overlying or adjacent structures.

H. If dewatering does not properly dewater the trench as specified, install groundwater observation wells. Do not place any pipe or structure until the readings obtained from the observation wells indicate that the groundwater has been lowered a minimum of 6-in. below the bottom of the final excavation within the trench limits.

I. Dewatering units used in the work shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from the dewatering system shall be continuous until pipe or structure is adequately backfilled. Standby pumps shall be provided.

J. Water entering the excavation from precipitation or surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sump and pumped from the excavation to maintain a bottom free from standing water.

K. Existing or new sanitary sewers shall not be used to dispose of surface drainage or groundwater.

L. Provide Erosion Control Measures as necessary to prevent siltation runoff from the excavation drainage.

END OF SECTION

DIVISION 31 – EARTHWORK
SECTION 31 23 16 – EXCAVATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Excavating for building foundations.
B. Excavating for slabs-on-grade, paving and sidewalks.
C. Excavating for site structures.
D. Excavation for site utilities is specified in Division 33 –Utilities.

1.2 RELATED SECTIONS

A. Related Sections in this specification include but may not be limited to, the following:

1. Section 31 22 13 - Rough Grading
2. Section 31 23 19 – Dewatering and Drainage
3. Section 31 23 23 – Backfill
4. Plan Sheet notes shall apply to excavation for building structural foundations.

1.3 FIELD MEASUREMENTS

A. Verify survey benchmark elevations to be used for the work.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

3.2 EXCAVATION

A. Excavate subsoil required to accommodate building foundations, slabs-on-grade, paving and site structures, all as shown on plans.

B. Grade top perimeter of excavation to prevent surface water from draining into excavation.

C. Hand-trim excavation where inaccessible to machinery. Remove loose material from

finished excavated grade.

D. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work by Engineer.

E. Correct areas over-excavated in accordance with Section 31 23 23.

3.3 PROTECTION

A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

B. Protect bottom of excavations and soil adjacent to and beneath foundation, from freezing.

END OF SECTION 31 23 16

DIVISION 31 – EARTHWORK
SECTION 31 23 23 - BACKFILL

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Building perimeter and site structure backfilling to subgrade elevations. See Plan Sheet Notes.
B. Site filling and backfilling.
C. Fill under slabs-on-grade, paving and sidewalks.
D. Consolidation and compaction as scheduled.
E. Fill for over-excavation.
F. Backfilling for utility trench excavation is specified in Division 33 -Utilities.

1.2 RELATED SECTIONS

A. Related Sections in this Specification include, but may not be limited to, the following:

1. Section 03 30 00 – Cast-in-Place Concrete
2. Section 31 23 16 – Excavating
3. Section 31 23 00 – Dewatering and Drainage
4. Section 32 05 13 – Soil Materials
5. Section 46 12 00 – Water Main Piping Valve Fittings and Accessories
6. Backfilling for building structures is specified in the notes on Plan Sheet Notes.

1.3 REFERENCES

A. ASTM D698 - Standard Laboratory Density
B. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
C. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.4 SUBMITTALS

A. Material Sources: Submit name and location of imported material suppliers for approval for backfill and topsoil materials.
B. Provide materials from same source throughout the work.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Fill subsoil: As specified in Section 32 05 13.
B. Structural Fill: As specified in Section 32 05 13.

2.2 ACCESSORIES

A. Vapor Retardant: 6 mil thick, polyethylene per Section 03 30 00 Cast-in-Place Concrete.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify subdrainage, dampproofing or waterproofing installation has been inspected.

3.2 PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of *in situ* compaction. Backfill with specified fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Structural Fill: Place and compact materials in continuous layers not exceeding 6" depth.

D. Soil Fill: Place and compact material in continuous layers not exceeding 6" depth.

E. Employ a placement method that does not disturb or damage other work.

F. Maintain optimum moisture content of backfill materials to attain required compaction density. Do not backfill against unsupported foundation walls.

G. Backfill simultaneously on each side of foundation walls.

H. Slope grade away from building.

I. Make gradual grade changes on site grading. Blend slope into level areas.

J. Remove surplus backfill materials from site.

3.4 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1/10 foot from required elevations.

3.5 FIELD QUALITY CONTROL

A. Testing and Inspection: Contractor shall engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports for Engineer's review.

B. Compaction testing will be performed in accordance with ASTM D698, ASTM D2922, and ASTM D3017.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished Work from erosion and disturbance by construction traffic.
B. Reshape and recompact fills damaged or disturbed by traffic.

3.7 SCHEDULE

A. Interior Slab-On-Grade:

1. As specified on Plan Sheets.

B. Exterior Side of Foundation Walls:

1. As specified on Plan Sheets.

C. Fill Under Grass Areas:

1. Use subsoil materials to adjust grade to 8 inches below finish grade, compacted to 95% of maximum dry density Standard Proctor.

D. Structural Fill under Sidewalk, Paved Areas (including aggregate surfaces) and all structure Foundations.

1. Structural fill to subgrade elevation, each 1 foot compacted to 98% of maximum dry density Standard Proctor.

E. Fill to Correct Over-excavation:

1. Understructures fill to subgrade elevation in 6" lifts each compacted to 98% of maximum dry density Standard Proctor.

2. General site grade adjustment, fill to subgrade elevation in 8" lifts each compacted 90% of maximum dry density Standard Proctor.

END OF SECTION 31 23 23

DIVISION 31 00 00 – EARTHWORK AND SITEWORK
SECTION 31 37 00 - RIPRAP

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Special Provisions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the furnishing, transporting, placing, finishing and grading Riprap.

1.3 RELATED SECTIONS

A. The following sections contain requirements that relate to this section:

1. Section 01 10 10 – Summary of Work Sequence.
2. Section 01 14 00 – General Coordination.
3. Section 31 05 00 – Earthwork.
4. Section 31 37 10 – Filter Fabric for Use with Riprap.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with requirements of the following specifications as modified herein.

1. Illinois Department of Transportation, latest edition.

a. Standard Specifications for Road and Bridge Construction.
b. Supplemental Specifications and Recurring Special Provisions.
c. References to sections on measurement and basis of payment shall not apply.

B. Testing and Inspection: Owner will provide engineering, testing and inspection.

PART 2 PRODUCTS

2.1 Materials shall conform to the requirements of Section 1005 of the above-referenced Standard Specifications.

A. Stone article 1005.01.

1. Quality designation A.

2.2 GRADATION

A. Rock size: 3-inches to 6-inches

1. Gradation: RR 3

PART 3 EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Construction shall conform to the plans.

3.2 PLACEMENT

A. Placement shall conform to Article 281.04 paragraph a.

END OF SECTION 31 37 00

DIVISION 32 – EXTERIOR IMPROVEMENTS
SECTION 32 05 13 – SOIL MATERIALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Subsoil and topsoil materials.

B. Subsoil is soil material to be used for backfilling and/or adjustment of grade at elevations below required subgrade for topsoil placement or disposal off site.

C. Topsoil is soil material to be used for finished site landscaping and seeding. Any excess topsoil material shall be stockpiled at the site for future use by the Owner and not removed.

1.2 RELATED SECTIONS

A. Related Sections in this specification include but may not be limited to, the following:

1. Section 31 10 00 - Site Clearing
2. Section 31 22 13 - Rough Grading
3. Section 31 23 16 – Excavation
4. Section 31 23 00 – Dewatering and Drainage
5. Section 31 23 23 – Backfill

1.3 REFERENCES

A. ASTM D698 - Standard Laboratory Density

B. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

C. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.4 SUBMITTALS

A. Material Sources: Submit name and location of imported material suppliers for approval for backfill and top-soil materials.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Subsoil: Excavated and reused material, graded, free of lumps larger than 3 inches in diameter, rocks larger than 2 inches in diameter and sod, frozen material, weeds, or roots.

B. Subsoil: Imported material shall be same as paragraph 2.1.A. Provide materials from the same source throughout the job.

C. Topsoil: Imported meeting Article 211 Standard Specifications for Road and Bridge Construction adopted January 1, 2022, by the Illinois Department of Transportation.

Material shall be free of roots, rock larger than 1/2-inch, subsoil, debris, weeds and foreign matter.

D. Structural Fill: Naturally or artificially graded mixture of neutral crushed gravel, crushed stone, crushed slag, natural or crushed sand, as acceptable to the Engineer. Acceptable aggregate gradations shall be CA-6 or CA-11, unless noted otherwise.

2.2 SOURCE QUALITY CONTROL

A. Engineer will approve materials and source.

B. Inspection and Testing: Contractor shall engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports for Engineer's review.

PART 3 EXECUTION

3.1 STOCKPILING

A. Stockpile materials on site at locations approved by Engineer.

B. Separate differing materials with dividers or stockpile apart to prevent mixing.

C. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.2 STOCKPILE CLEANUP

A. Remove stockpile and dispose of excess materials off-site, except for topsoil materials as noted in Paragraph 1.1.C. above. Leave the area in a clean and neat condition. Grade site surface to prevent free-standing surface water.

END OF SECTION 32 05 13

DIVISION 32 – EXTERIOR IMPROVEMENTS
SECTION 32 11 00 – AGGREGATE BASE COURSE

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Provide the materials and placement of one or more courses of aggregate on a prepared subgrade or sub-base as shown on the drawings, all in accordance with the IDOT Standard Specifications for Road and Bridge Construction, adopted January 1, 2022, except as modified herein.

1.2 RELATED SECTIONS

A. Related Sections in this Specification include but may not be limited to the following:

1. Section 31 22 13 - Rough Grading

1.3 APPLICABLE STANDARDS

A. Codes and Standards: Comply with requirements of the following specifications as modified herein.

1. Illinois Department of Transportation, latest edition

a. Standard Specifications for Road and Bridge Construction adopted January 1, 2022
b. Supplemental Specifications and Recurring Special Provisions adopted January 1, 2024.

2. U.S. Department of Transportation Federal Highway Administration

a. Manual of Uniform Traffic Control Devices for Streets and Highways

B. Testing and Inspection: Contractor shall engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports for Engineer's review.

1.4 SUBMITTALS

A. Make submittals in accordance with Section 01 33 23.

PART 2 PRODUCTS

2.1 MATERIALS

A. Aggregate Base course Type B shall be used.

B. Gradation: CA 6 or CA 7 (or as specified on the contract drawings)

PART 3 EXECUTION

3.1 PREPARATION

A. Construction shall conform to the Plans and the above-referenced Specifications. All work shall be in accordance with Section 351 of the IDOT Standard Specifications.

END OF SECTION 32 11 00

DIVISION 32 – EXTERIOR IMPROVEMENTS
SECTION 32 13 13 - PORTLAND CEMENT CONCRETE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. This section includes concrete paving for roads, parking areas, and sidewalks, as shown on the plans.

1.2 RELATED SECTIONS

A. Related Sections in this specification includes but may not be limited to, the following:

1. Section 03 30 00 – Cast-in-Place Concrete
2. Section 31 22 13 – Rough Grading
3. Section 31 23 16 – Excavation

1.3 APPLICABLE STANDARDS

A. Codes and Standards: Comply with requirements of the following specifications as modified herein.

1. Illinois Department of Transportation, latest edition

a. Standard Specifications for Road and Bridge Construction adopted January 1, 2022.
b. Supplemental Specifications and Recurring Special Provisions adopted January 1, 2025.
c. Manual of Test Procedures for Materials.
d. References to sections on measurement and basis of payment shall not apply.

2. U.S. Department of Transportation Federal Highway Administration

a. Manual of Uniform Traffic Control Devices for Streets and Highways.

B. Testing and Inspection: Contractor shall engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports for Engineer's review.

1.4 SUBMITTALS

A. General: Submit the following in accordance with the Conditions of Contract and Division 1 Specification Sections.

1. Concrete supplier Source, Name, Address, Phone/Fax, P.O.C.
2. Material certificates signed by the manufacturer, ready-mix plant, and contractor certifying compliance with specified requirements and identifying source of all

materials.

3. Laboratory test reports for concrete materials and mix design test.
4. Mix design and proportioning certification.
5. Delivery tickets for every concrete delivery to the site.

PART 2 PRODUCTS

2.1 CONCRETE

A. Class PV for pavement.

B. Class SI for sidewalk, curb and gutter, culverts, structures and miscellaneous.

2.2 REINFORCEMENT

A. Grade 60.

PART 3 EXECUTION

3.1 PREPARATION

A. Notify Engineer when excavations have reached required subgrade.

B. When the Engineer determines that unforeseen unsatisfactory soil is present, excavate and replace with approved compacted backfill or fill material in accordance with Specification Sections 31 23 16 and 31 23 23.

C. Reconstruct subgrades damaged by rain, accumulated water, or construction activities, as approved by the Engineer.

D. Test rolling of subgrade for parking lots, roads and streets.

1. The Contractor will provide a loaded truck and test roll the compacted earth subgrade in the presence of the Engineer before any subbase, base or surface material is placed. The truck shall be loaded as follows: 27,000 lbs. (12,250 kilograms) on two axles and 45,000 lbs. (20,400 kilograms) on three axles with a tolerance not to exceed 10%. The Contractor shall give the Engineer 48-hour notice prior to test rolling.
2. The truck shall make one pass over the entire subgrade area to be constructed. Any areas that show rutting, cracking or rolling of the compacted subgrade, upon test rolling, will not be accepted. The Contractor will recompact and/or reconstruct the section that fails and test roll again prior to acceptance.

3.2 PLACEMENT

A. Placement shall be per the above referenced Specifications and Plans.

3.3 FIELD QUALITY CONTROL

A. Proportioning, Testing and Inspection Service: The Contractor shall provide a qualified engineering testing agency to provide engineering, proportioning, testing and inspection for **plant** and **field.**

B. Construction Observation: Owner will employ a qualified engineering agency to perform construction observation.

3.4 JOINTS

A. General: Construct contraction, construction, and expansion joints as shown on the drawings and as specified below.

B. Contraction Joints: Construct contraction joints for a depth equal to at least 1/4 of the concrete thickness, as follows:

1. Tooled Joints: Forming contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool meeting minimum depths will be allowed.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-in.-wide (3 mm) joints into hardened concrete when cutting action will not tear, abrade, or otherwise damage surface and before development of random contraction cracks. Sawed transverse joints shall not be greater than 15 feet apart and shall conform to the details in the Plans.
3. The sawing of contraction joints shall commence within four hours of the start of the pour. Sawing shall continue until all the joints are completed.
4. The Concrete Gutter shall be sawed or scored, coinciding with the joint interval of the adjoining concrete pavement.
5. Minimum joint depth of the gutter shall be 2-in. (50 mm).
6. Provide No. 6 tie bars 30-inches long at 30-inch centers along all contraction joints (saw joints).

C. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at expansion joints.

1. Continue reinforcement across construction joints. Do not continue reinforcement through sides of strip paving unless indicated.
2. Provide tie bars at sides of paving strips.

D. Expansion Joints: Form expansion joints of bituminous preformed joint filler as specified below.

1. Locate ½-in. thick (13 mm) expansion joints at intervals of 50-ft (15 m), and between pours in sidewalk, and 1-in. (25 mm) thick bituminous pre-molded joint filler at all P.C.'s, P.T.'s, R.P.C.'s and at maximum 500-ft (150 m) intervals in pavement and curbs and gutters. Expansion joints in concrete gutter shall

correspond to location of expansion joints in pavement.

2. Extend joint fillers full width and depth to 1-in. (25 mm) below the bottom of pavement. Place top of joint filler flush with finished concrete surface.
3. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
4. Protect top edge of joint filler during concrete placement.

3.5 CONCRETE PLACEMENT

A. The Contractor shall stop the paving operation at 4:30 p.m. unless approved otherwise by the Engineer. Sawing shall continue at the same rate as stated above, until sunset. If joints are not completed by sunset, sawing shall commence at sunrise and continue at the same rate as the previous day until all joints are complete.

B. Trucks and mixer trucks will be allowed to operate on the subgrade; however, should subgrade show any sign of distress, all operations will cease until these items are corrected to the satisfaction of the Engineer. Any subgrade distressed by trucks and mixer trucks shall be repaired at the Contractor's expense. No additional compensation shall be allowed.

3.6 FINISHES

A. Pavement

1. Final finish shall be Type B, except a burlap drag or light broom may be substituted for the artificial turf drag.
2. The Contractor shall prepare a sample pavement section with the proposed finish for review and approval by the Owner prior to completing any pavement work on site.
3. A 10-foot straightedge will be used for surface testing.

B. Sidewalks

1. Light broom finish.

END OF SECTION 32 13 13

DIVISION 32 – EXTERIOR IMPROVEMENTS
SECTION 32 15 00 – AGGREGATE SURFACE COURSE

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. The work covered by this specification shall consist of furnishing and placing one or more courses of aggregate upon a prepared subgrade were shown on the plans.

1.2 RELATED SECTIONS

A. Related Sections in this specification includes but may not be limited to, the following:

1. Section 31 22 13 - Rough Grading

1.3 APPLICABLE STANDARDS

A. Codes and Standards: Comply with requirements of the following specifications as modified herein.

1. Illinois Department of Transportation, latest edition

a. Standard Specifications for Road and Bridge Construction adopted January 1, 2022.
b. Supplemental Specifications and Recurring Special Provisions adopted January 1, 2024.

B. Testing and Inspection: Contractor shall engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports for Engineer's review.

1.4 SUBMITTALS

A. Make submittals in accordance with Section 01 33 23.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials shall meet the Type B requirements of Article 402 of the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction adopted July 1, 2012.

B. CA6 or CA10 shall be used, unless otherwise noted on the plans.

PART 3 EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Construction shall be as per Section 402 Aggregate Surface Course, Illinois Department of Transportation Standard Specifications for Road and Bridge Construction adopted January 2012.

B. Type B base shall be used.

C. Minimum 8-inch thick.

D. Limestone white rock.

E. Spreader box will not be required.

END OF SECTION 32 15 00

DIVISION 32 – EXTERIOR IMPROVEMENTS
SECTION 32 31 13 - GALVANIZED CHAIN LINK FENCE AND GATES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. DIVISION 01 - GENERAL REQUIREMENTS: Drawings, quality, product and performance requirements, general and supplemental conditions apply as applicable to the project and project documents.

1.2 SUMMARY

A. This Section includes industrial/commercial chain link fence and gates specifications:

1. Galvanized steel coated chain link fabric
2. Galvanized steel framework and fittings
3. Gates: swing and cantilever slide
4. Barbed wire
5. Installation

1.3 REFERENCES

A. ASTM A121 Specification for Metallic-Coated Carbon Steel Barbed Wire

B. ASTM A392 Specification for Zinc-Coated Steel Chain-Link Fence Fabric

C. ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

D. ASTM F552 Standard Terminology Relating to Chain Link Fencing

F. ASTM F567 Standard Practice for Installation of Chain Link Fence

G. ASTM F626 Specification for Fence Fittings

H. ASTM F900 Specification for Industrial and Commercial Swing Gates

I. ASTM F1043 Specification for Strength and Protective Coatings of Steel Industrial Chain Link Fence Framework

J. ASTM F1083 Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

K. ASTM F1184 Specification for Industrial and Commercial Horizontal Slide Gates

L. ASTM F2200 Specification for Automated Vehicular Gate Construction

M. UL325 Automatic operators: Door, Drapery, Gate, Louver and Window

1.4 DEFINITIONS

A. See ASTM F552, “Standard Terminology Relating to Chain Link Fencing” for a complete list.

B. CLFMI: Chain Link Fence Manufacturers Institute.

C. Chain link fabric – A fencing material consisting of wire helically wound and interwoven in such a manner as to provide a continuous mesh without knots or ties except in the form of knuckling or twisting at the top and bottom of the mesh to form the fabric selvage.

D. Selvage – The top and bottom edge finish on woven chain link formed by joining adjacent pairs of wire pickets. The selvage may be knuckled or twisted.

1. Knuckled selvage refers to bending the adjacent pairs of wire back into a tight loop.



2. Twisted selvage refers to twisting the adjacent pairs of wire together in a close helix of 1 ½ machine turns, which is equivalent to three full twists.



E. Mesh size – The minimum clear distance between the wires forming the parallel sides of the mesh.
F. Terminal post – A post to which the chain link fabric is terminated using specific fittings; this includes end posts, corner posts, gate posts and pull posts. A terminal post used to accommodate a grade or placed at intervals on long stretches of fence.
G. Line post – Intermediate posts spaced between the terminal posts.
H. See Typical Fence Section drawing for details of various fence fittings, tension bar, truss rod, tension band, brace band, rail end and barb arm.

1.5 SUBMITTALS

A. Shop drawings: Provide a site plan showing layout of fence location, in accordance with the contract drawing. Plan shall provide dimensions, location of gates and opening sizes, cleared area, elevation of fence, gates, footings, and details of attachments.

1.6 QUALITY ASSURANCE

A. Fence Contractor: Company with demonstrated successful experience installing similar projects and products in accordance with ASTM F567 and have at least 5 years demonstrated experience.
B. Source Limitations for Chain-Link Fences and Gates: Obtain each color, grade, finish, type, and variety of component for chain-link fences and gates from one source with resources to provide chain-link fences and gates of consistent quality in appearance and physical properties.

PART 2 – PRODUCTS

2.1 CHAIN LINK FABRIC

A. Steel Chain Link Fence Fabric shall be not less than 2.75 meters high.
B. Mesh and Wire Size: 50mm (2”) mesh, 3.76 mm diameter (9 gauge) wire.
C. Zinc-Coated Fabric: Fabric shall comply with ASTM A392, with zinc coating applied to steel wire before weaving according to ASTM A817. Fabric shall be Type II, zinc coated (hot dip galvanized) with a minimum zinc coating of 1.20 oz/ft² (366 g/m²).
D. Fabric selvage: Provide selvages twisted at top of fence and knuckled at bottom of fence.

2.2 FENCE FRAMEWORK

A. Framework shall be standard weight, Schedule 40, hot dip galvanized round steel pipe complying with ASTM F 1083. Comply with ASTM F 1043, Material Design Group IA, external and internal coating Type A, consisting of not less than 1.8 oz./sq. ft. (0.55-kg/sq. m) zinc, and the following requirements:

1. Corner, End and Pull Posts shall be equivalent to a minimum of 73 mm (2-7/8 inch) O.D galvanized Schedule 40. Pull posts shall be used at all abrupt changes in grade and at intervals no greater than 152 meters (500 feet). On runs over 152 meters (500 feet), pull posts shall be evenly spaced between corner and end posts.

2. Line Posts shall be a minimum of 60.3 mm (2-3/8 inches) O.D galvanized Schedule 40 steel pipe. Posts shall be spaced equidistant in the fence line with a maximum spacing of 3 meters (10 feet) on center.

3. Post Brace Rails shall be equivalent to a minimum of 42.2 mm (1-5/8 inches) O.D galvanized Schedule 40 steel pipe. Provide brace rail with truss rod assembly for each gate, end, and pull post.

23 TENSION WIRE

A. Provide Metallic Coated Steel Marcelled Tension Wire, 7 gauge (4.50 mm) (0.177 in.) complying with ASTM A824. Galvanizing shall be Type II with a minimum zinc coating of 1.20 oz/ft² (366 g/m²).

24 BARBED WIRE

A. Provide (Type I) three strand outrigger arm 45 degrees (from the vertical plane) on top of all fencing and gates. Outrigger arm shall be angled to the outside of the fenced area. Barbed wire outrigger arms shall be in compliance with ASTM F626, pressed steel, hot dip galvanized after fabrication, minimum zinc coating of 1.20 oz./ft² (366 g/m²), capable of supporting a vertical 113 kg (250 lb.) load.

B. Provide three (3) strands of Zinc-Coated Steel Barbed Wire at the top of all fencing and gates, complying with ASTM A121. Barbed wire shall be Standard Size and Construction: 2.51 mm (0.099 inch) diameter line wire with 2.03 mm (0.080 inch) diameter, 4-point round barbs (or 2-point, if 4-point is not locally available) spaced not more than 5 inches (127mm) O.C.

25 FITTINGS

A. Provide post caps for all posts. Terminal Post Caps, Line Post Loop Tops, Rail and Brace Ends, Boulevard Clamps, and Rail Sleeves shall be complying to ASTM F626, pressed steel hot dip galvanized after fabrication having a minimum zinc coating of 1.20 oz/ft² (366 g/m²).

B. Tension and Brace Bands: Hot dip galvanized pressed steel complying with ASTM F626, minimum steel thickness of 12 gauge (2.67 mm) (0.105 in.), minimum width of 19 mm (3/4 in.) and minimum zinc coating of 1.20 oz/ft² (366 g/m²). Secure bands with 7.94 mm (5/16 in.) galvanized steel carriage bolts.

C. Truss Rod Assembly: In compliance with ASTM F626, 9.53 mm (3/8 in.) diameter steel truss rod with a pressed steel tightener, hot dip galvanized with minimum zinc coating of 1.2 oz/ft² (366 g/m²). Assembly shall be capable of withstanding a tension of 2,000 lbs. (970 kg).

D. Tension Bars shall be in compliance with ASTM F626. Provide hot dip galvanized steel one-piece bars, with a length 50 mm (2 in.) less than the fabric height. Minimum zinc coating shall be 1.2 oz. /ft² (366 g/m²). Bars for 2 in. (50 mm) mesh shall have a minimum cross section of 4.8 mm (3/16 in.) by 19 mm (3/4 in.).

E. Tie Wire and Hog Rings: Provide hot dip galvanized steel wire, minimum zinc coating 1.20 oz/ft² (366 g/m²), 9 gauge (3.76 mm) (0.148 in.) in compliance with ASTM F626.

26 SWING GATES

A. Provide swing gates (Single and Double) as shown on the plans along with single man gates as shown on the plans.
   1. Match gate fabric to that of the fence system.
   2. Gateposts shall be a minimum of 73mm (2-7/8 inch) O.D hot dip galvanized Schedule 40 steel pipe, complying with ASTM F1083.

3. Double swing gate shall be hot dip galvanized steel pipe, welded fabrication, in compliance with ASTM F900. Gate frame members shall be a minimum of 48.3 mm (1.90 in.) O.D. schedule 40 galvanized steel pipe, in compliance with ASTM F 1083.
4. Frame members shall be spaced no greater than 2.44 meters (8 ft.) apart vertically and horizontally.
5. Protect welded joints by applying zinc-rich paint in accordance with ASTM Practice A780.
6. Barbed wire mounting shall transition to vertical at the center of the gates to allow inward swing.
7. Hardware: Provide hinges, latches permitting operation from both sides of gate, and keepers for each gate leaf. Fabricate latches with integral eye openings for padlocking; padlock shall be accessible from both sides of gate.

2.7 CONCRETE

A. Concrete for post footings shall be normal-weight concrete with not less than 20.7 MPa (3000 psi) compressive strength at 28 days, 75 mm (3-inch) slump, and 25 mm (1-inch) maximum size aggregate.

PART 3 – EXECUTION

3.1 PREPARATION

A. Verify the layout information for chain-link fences and gates shown on Shop Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

B. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 150 meters (500 feet) or line of sight between stakes. Indicate locations of any known underground structures, benchmarks, and property monuments.

C. Clear, grub, and grade fence line, removing debris and providing a 1-meter clear area on either side of the fence. Indicate in the Shop Drawings the extent of the area to be cleared and grubbed.

3.2 FRAMEWORK INSTALLATION

A. Posts: All Posts shall be set plumb in concrete footings in accordance with ASTM F567. Minimum footing depth shall be per manufacturer's recommendations, but no less than 1 meter. Minimum footing diameter shall be per manufacturer's recommendations, but no less than 300 mm (12 in.). For swing gate posts, the foundation diameter shall be not less than 450 mm (18 in.). Top of concrete footing shall be at grade, crowned to shed water away from the post.

B. Fabric shall not be attached to posts until the concrete footings have cured for at least five days.

C. Tension wire: Shall be installed 100 mm (4 in.) up from the bottom of the fabric and 100

mm (4 in.) down from the top of the fabric. Tension wire shall be stretched taut, independently and prior to the fabric, between the terminal posts and secured to the terminal post using a brace band. Secure the tension wire to each line post with a tie wire.

D. Post Bracing Assemblies: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts. Locate horizontal braces at two-thirds fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

3.3 CHAIN LINK FABRIC INSTALLATION

A. Chain Link Fabric: Install fabric to outside of the framework. Attach fabric to the terminal post by threading the tension bar through the fabric; secure the tension bar to the terminal post with tension bands and 7.94 mm (5/16 in.) carriage bolts spaced no greater than 305 mm (12 in.) O.C. Chain link fabric shall be free of sag, and secured to the line post with tie wires spaced no greater than 300 mm (12 in.) O.C. Secure fabric to the tension wire with hog rings spaced no greater than 450 mm (18 in.) O.C.
B. Fabric shall be pulled tight so that the maximum deflection of the fabric is 50 mm (2 in) when a 22.5 kilograms (50 pounds) pull is exerted perpendicular to the center of the panel.
C. Tie wire shall be wrapped 360 degrees around the post or rail and the two ends twisted together three full turns. Excess wire shall be cut off and bent over to prevent injury.
D. The bottom of the fence fabric shall meet the finished grade such that it prevents surreptitious human entry.

3.4 BARBED WIRE INSTALLATION

A. Barbed Wire: Stretched taut, free of sag, between terminal posts and secured in the slots provided on the line post barb arms. Attach each strand of barbed wire to the terminal post using a brace band.

3.5 GATE INSTALLATION

A. Swing Gates: Installation of swing gates shall be in compliance with ASTM F 567. Direction of swing shall be inward. Gates shall be plumb in the closed position having a bottom clearance of 75 mm (3 in.) above grade. The ground under the swing arc shall be graded to allow for operation.

3.6 NUTS AND BOLTS

A. Bolts: Carriage bolts used for fittings shall be installed with the head on the secure side of the fence. All bolts shall be peened over to prevent removal of the nut.

3.7 ELECTRICAL GROUNDING

A. Grounding: The fence shall be grounded every 100 meters (110 yards) by a 1.8-meter (6 foot) ground rod connected to the fence fabric with grounding clamps and number

10-gauge wire.

3.8 CLEAN UP

A. Clean Up: The area of the fence line shall be left neat and free of any debris caused by the installation of the fence.

END OF SECTION 32 31 13

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

DIVISION 32 – EXTERIOR IMPROVEMENTS
SECTION 32 91 19 – LANDSCAPE GRADING

PART 1 GENERAL

1.1 WORK INCLUDED

A. Finish grade subsoil.

B. Place, level and compact topsoil.

1.2 RELATED WORK

A. Related sections in this specification include, but may not be limited to, the following:

1. Section 31 22 13 - Rough Grading
2. Section 31 23 23 – Backfill
3. Section 32 05 13 - Soil Materials
4. Section 32 15 00 - Aggregate Surface Course
5. Section 32 92 00 - Topsoil, Seeding, Fertilizing and Mulching

PART 2 PRODUCTS

2.1 MATERIAL

A. Topsoil: as specified in Section 32 05 13

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify building and trench backfilling have been inspected.

B. Verify substrate base has been contoured and compacted.

3.2 SUBSTRATE PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove debris, roots, branches, stones, in excess of 2 inches in size. Remove subsoil contaminated with petroleum products and dispose of removed materials as required by applicable codes and laws.

C. Scarify subgrade to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment is used for hauling and spreading topsoil and has compacted subsoil.

3.3 PLACING TOPSOIL AT WATER TREATMENT PLANT SITE

A. Place topsoil in areas where seeding to a loose depth of 8 inches. Place topsoil during dry

weather. Compact in lifts of 4 inches at a time.

B. Fine grade topsoil eliminating rough or low areas. Maintain profiles and contour of subgrade.

C. Remove roots, weeds, rocks and foreign material while spreading.

D. Manually spread topsoil close to trees, sidewalks, buildings, vaults, manholes, valve boxes, etc. to prevent damage.

E. Compact placed topsoil to 85% of maximum dry density Standard Proctor.

F. Remove surplus subsoil from site. Any excess topsoil material shall be stockpiled for future use by the Owner and not removed.

G. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.4 AGRICULTURAL RESTORATION

A. Minimum 18-inch depth of the topsoil will first be stripped from the area to be excavated for water or sewer line trench, all bore pits, and other areas of excavation.

B. All subsoil material which is removed from the trench will be placed in a second stockpile that is separate from the topsoil stockpile.

C. In backfilling the trench and other excavated areas, the stockpiled subsoil material will be placed back into the trench first. The topsoil will be replaced last so that it remains the top layer of soil.

D. The topsoil and subsoil must be replaced within the trench and other excavated areas so that after settling occurs, the land's original contour (with an allowance for settling) will be achieved.

3.5 TOLERANCES

A. Top of Topsoil: Plus, or minus 1/10 foot.

END OF SECTION 32 91 19

DIVISION 32 – EXTERIOR IMPROVEMENTS
SECTION 32 92 00 – TOPSOIL, SEEDING, FERTILIZING AND MULCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This item shall include furnishing and spreading of topsoil to a depth of approximately six (6) inches compacted thickness over all disturbed areas of the project site and furnishing and planting of seed and furnishing and application of mulch as herein specified.

B. Areas to be covered with topsoil, seeded, fertilized, and mulched could include but not necessarily limited to:

1. All pipeline routes and site utility construction areas within the project site
2. All disturbed areas on the project site
3. All areas disturbed by this construction contract.

1.2 RELATED SECTIONS

A. Related sections in this specification include, but may not be limited to, the following:

1. 31 10 00 - Site Clearing
2. 31 22 13 - Rough Grading
3. 32 05 13 - Soil Materials

1.3 ACCEPTANCE

A. Substantial Completion: All work in this Section must be complete for Substantial Completion. The sixty (60) day maintenance period and one year guarantee will begin when the Owner prepares the Certificate of Substantial Completion.

B. Upon written request by the Contractor, the Owner will make a substantial completion inspection. The Contractor shall provide all submittals to the Owner 5 days prior to the Substantial or Final Completion Inspection. Final Completion will be given at the end of the sixty (60) day maintenance period.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Turfgrass Seed Mix Product Data Sheets

1.5 QUALITY ASSURANCE

A. Warranty: Provide a written one-year warranty from the Date of Substantial Completion upon award of Substantial Completion of the project.

1.6 MAINTENANCE

A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees as required in Part 3 of this specification. Begin maintenance immediately after each area is planted and continue until acceptable turf is established. Maintenance shall be performed on a weekly schedule. Provide the owner a written report each Friday of maintenance operations performed that week. If the Contractor fails to perform the weekly maintenance the Owner shall provide a written notice of failure to comply. If maintenance is not performed within 7 days of written notice the Owner reserves the right to withhold payment and hire additional help to perform the maintenance operations.

B. Substantial Completion to Final Acceptance Maintenance: Upon award of Substantial Completion of the project, the Contractor shall continue to provide maintenance for an additional 60 days, per Part 3 of this specification. Upon completion of the 60 days, the Contractor shall request a final inspection of the work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil: Shall be as specified in Section 320513 - Soil Materials. Topsoil shall have demonstrated, in its original position, the ability to grow healthy grass. Material shall be obtained from the previously stockpiled topsoil associated with site clearing. If sufficient stockpiled stripping topsoil is not available, additional material shall be obtained from off-site sources at no additional cost to the Owner.

B. Seed: The quality, purity, sampling, testing, packing, storing, etc., shall conform to Section 250 of the "Standard Specifications, Department of Transportation, State of Illinois," adopted January 1, 2012. All seed shall be delivered to the site in bags, unmixed and treated. For all areas to be seeded, the following mixture shall be used.

40% Perennial Ryegrass (2 of 3 of the following)
- Accent
- Caddieshack II
- TopGun II

30% Kentucky Blugrasses (2 of 3 of the following)
- NuBlue
- BlueChip
- Everest
- Liberator

30% Creeping Red Fescue
- Aruba
- Audubon

1. Seeding Rate: 300 lbs. per acre.

2. Approved Suppliers:
   a. Jacklin Seed by Simplot or approved equal
   b. Additional supplies may be submitted by the Contractor. Grass varieties shall remain the same.

C. Fertilizer: The fertilizer mix shall be ten (10) percent Nitrogen, six (6) percent Phosphoric Acid and four (4) percent water-soluble Potash (10-6-4) and applied at the rate of 240 pounds per acre. The following information shall be shown on the fertilizer bags:

1. Name and address of manufacturer
2. Name, brand or trademark
3. Number of net pounds of ready-mixed material in the package.
4. Chemical composition of analysis.
5. Guarantee.

D. Mulch: All mulch material shall be free from weeds and noxious weed seed and shall be approved by the Engineer.

Material for bituminous material shall conform to standard commercial practices for mulching. The rate of asphalt application shall not be less than 75 gallons per ton of mulch.

Straw shall be stalks of wheat, rye, oats or approved straw, and shall be reasonably dry. Partially decomposed straw of the previous year's crop is preferred. Straw may contain a mixture of not more than 50 percent by volume of coarse, barnyard manure.

Hay shall be obtained from field of timothy, red top, mature brome grass, or other native grasses. It shall be reasonably dry. Partially decomposed hay of the previous year's crop is preferred.

PART 3 EXECUTION

3.1 TOPSOIL

A. The areas to be covered shall first be shaped, trimmed and finished in compliance with the plans after all construction work in the area has been completed. Any irregularities or depressions in the surface due to weathering or other causes shall be filled or smoothed out before topsoil is placed at no additional cost.

B. Areas to be covered shall then be Landscape Graded according to Section 32 91 19.

C. The topsoil shall be graded by machine and/or hand graded to produce a finished surface, which is smooth, properly drained and free from ruts, stones, rocks, roots, and other foreign materials.

3.2 SEEDING

A. Seeding will be permitted only during the regular planting seasons, which are in the Spring from April 1 to June 1, and the Fall from August 15 to October 15. No seeding shall be done during high winds, when the ground surface is too wet, nor when soil and weather

conditions are unfavorable for seeding. Seeding shall consist of the following operations:

1. Disking
2. Harrowing
3. Seeding
4. Brushing
5. Rolling

Each operation shall follow the preceding one in as short a time as is practical to do so.

B. Disking: This operation shall be accomplished with a disk harrow, the disks of which are set at a slight angle. The disking shall be performed both lengthwise and crosswise whenever practicable to do so. Should the area become crusted or hardened prior or harrowing, then it shall again be disked.

C. Harrowing: Just prior to sowing seed, the surface of the area shall be thoroughly smoothed by means of a harrow. The harrow used shall be either a Meeker Smoothing Harrow or a 3-section Meeker Disking Machine or approved equal. Harrowing shall be first crosswise and then lengthwise where practical to do so.

D. Seeding: The seeding shall be accomplished with a wheel-harrow grass seeder similar and equal to the ten (10) foot Thompson Grass Seeder. Whenever practical, the sowing operations shall be conducted in two directions at right angles to each other. The seeder shall be calibrated to give the proper rate of distribution.

E. Brushing: Immediately following the sowing, the seed shall be lightly brushed into the soil by means of an approved chain drag.

F. Rolling: Immediately after brushing, the seeded area shall be rolled with a tractor-drawn type roller known as the "Farmer Roller" or “Golf Roller."

G. Each area shall be brushed and rolled the same day the seed is sown.

3.3 FERTILIZING

A. Fertilizer shall be evenly spread over the seeding area before harrowing. Spreading or fertilizer shall be by any approved method, which will ensure uniform distribution over the seeding area.

3.4 MULCHING

A. This method shall consist of applying a layer of asphalt-coated straw mulch within 24 hours from the time of seeding on seeded areas. This straw will have a partial coating of SS-1.

B. The coated mulch shall be placed by equipment which will blow or eject, by means of a constant air stream, controlled quantities of the straw and asphalt in a uniform pattern over the specified area. The rate of distribution shall be approximately two (2) tons per acre. If the straw mulch is excessively cut or broken, the Contractor shall take measures to reduce the

cutting or breakage. The mulch shall be loose enough to permit air to circulate but compact enough to reduce erosion.

C. The asphalt shall be introduced into the air stream by means of a spray arranged in such a manner that it will partially coat the straw mulch with a spotty asphalt track prior to the depositing of the mulch covering. The rate of application of the emulsified asphalt shall be from 75 to 100 gallons per ton of straw mulch.

D. Following the mulching operation, every precaution shall be taken to prohibit foot or vehicular traffic, or the movement of equipment over the mulched area. At any location where mulching has been displaced, the seeding or other work damaged as a result of that displacement shall immediately be repaired and the mulch covering replaced, at the Contractor's expense, in a manner satisfactory to the Engineer.

3.5 MAINTENANCE

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniform smooth turf. Provide materials and installation same as those used in the original installation.

B. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain height appropriate for species without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass leaf growth in initial or subsequent mowing. Maintain grass height at 3”, or recommendations of supplier.

C. The Contractor shall make whatever provisions are necessary to water the Turfgrass areas, as needed, during the maintenance period. This includes all labor, equipment, and cost of water.

3.6 FINAL ACCEPTANCE

A. Installations shall meet the following criteria as determined by the Owner:

1. For substantial completion a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities with coverage exceeding 50% over any 10 ft^2.
2. For final acceptance a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities with coverage exceeding 90% over any 10 ft^2 and bare spots not exceeding 2 x 2 inches.

END OF SECTION 32 92 00

DIVISION 43 – PROCESS EQUIPMENT
SECTION 43 24 13 – EXTERIOR PIPING, VALVES, FITTINGS AND ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions, Special Provisions and other Division 1 Specifications, apply to this Section.

1.2 SUMMARY

A. This Section includes:

1. Sanitary piping and appurtenances
2. Storm Sewer piping and appurtenances

B. Related Sections: The following sections contain requirements that relate to this section:

1. Section 01 10 10 – Summary of Work Sequence
2. Section 01 14 00 – Coordination
3. Section 01 33 00 – Submittals
4. Section 03 30 00 – Cast-in-Place Concrete
5. Section 09 90 00 – Process Equipment and Ferrous Metal Painting
6. Section 31 05 00 – Earthwork
7. Section 31 10 00 - Site Clearing
8. Section 31 23 00 – Dewatering and Drainage
9. Section 46 11 05 – Electric Actuators

1.3 SUBMITTALS

A. General: Submit the following in accordance with the conditions of Contract and Division 1 Specification Sections.

B. Product Data: Provide data indicating pipe, pipe accessories, fittings, pressure rating, and rated capacity.

C. Manufacturer's installation instructions: Indicate special procedures required to install products.

1. Laying schedule

2. Any special construction or manufacture to meet the requirements of 1.5.F. below.

D. Manufacturer's certificate: Certify that pipe meets or exceeds specified requirements.
1. Shall include but not be limited to:

a. Manufacturer’s drawings for pipe selected, showing full details of design, joints, fittings, manhole tees, flexible connection at structures, parallel pipe section, special requirements for bedding and backfill between parallel pipe segments.

b. Complete design calculations, load conditions, construction conditions, construction vehicle loadings and buoyancy.
c. Design calculations on pipe wall and thrust restraint system
d. The pipe manufacturer shall be responsible to verify the pipe design for the external loads due to soil loading and design specified live surface loads.

E. Buy American: Provide certification that all iron and steel products used in the project are produced in the United States per Section 436 of H.R. 3547, "The Consolidated Appropriations Act, 2014"

F. Field Quality Control Method, Procedures, Plan and Schedule.

1.4 DESIGN OF PIPE

A. All pipe shall be designed as detailed on the plans and conform to latest standard specified. Provide bedding and haunching at rigid structures as noted on the plans and conforming to the latest standard specified in the proposal alternate selected.

B. Pipe design shall include, but not be limited to, operating pressure, upsurge, downsurge, pipe material and its safety factor. All pipe shall be designed considering the combination of specified external loads with zero internal pressure for the interceptor sewer; proposed heavy construction equipment loads (driving over the pipe under minimum and proposed final cover); and buoyancy (groundwater at finished grade with pipe empty), and earth cover depths as shown on the plan drawings.

C. Lift holes in pipe will not be permitted.

D. Pipe shall be made by a manufacturer experienced in producing pipe of the type and size specified herein.

1.5 QUALITY ASSURANCE

E. Codes and Standards: Comply with the requirements of the latest edition of the following:

1. Standard Specifications for Water and Sewer Main Construction in Illinois, Sixth Edition, hereinafter referred to as the Standard Specifications, shall apply as modified below and by the Special Provisions modifying these Standard Specifications.

a. Pertinent standard drawings contained in the Specifications shall also apply except as modified in the Special Provisions or on the plan sheets.
b. Division I and VII of Standard Specifications shall not apply.

B. Pipe Manufacturer

1. Experienced in the design, manufacture and commercial supplying of the specific material for a minimum period of five years.
2. Experienced in the design, manufacture and commercial supplying of the specific size of pipe for a period of three years.

C. All pipe and fittings shall be from a single manufacturer.

D. The manufacturer shall be responsible for the performance of all acceptance tests.

E. Inspection of the pipe shall also be made by the Engineer or other representatives of the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall immediately be removed from the project. The Engineer may allow minor localized patching/repair of the pipe with an industry standard approved material and repair methodology. If allowed, the pipe repair procedure shall be submitted to the Engineer for approval.

1.6 PROJECT CONDITIONS

A. Verify Site Conditions

B. Site Information: Call JULIE 1-800-892-0123 48 hours before you excavate.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate with other work performed on site. Sequence installation, cleaning, flushing, jetting, pressure testing, disinfection, backfilling with other work performed on site.

B. Coordinate with other utility work.

PART 2 PRODUCTS

2.1 GENERAL – ALL PRODUCTS SHALL BE OF U.S. MANUFACTURE OR OF A COUNTRY SIGNATORY TO THE NAFTA ACT.

2.2 STORM SEWER PIPE AND FITTINGS

A. PVC PIPE SDR-26: ASTM D3034, ANSI/AWWA C153/A21.53 for mechanical or push-on joints designed as detailed on the plans.

1. Rubber-gasket joints ASTM F1336 and ASTM F477, bolts and nuts Cor-Ten (high strength, low alloy) or equal
2. Fittings: Ductile iron AWWA C-110 or C-153 with joints same as pipe.

3. Sanitary Service Connections (Laterals): shall be connected using the appropriate size Inserta Tee by Inserta Fittings co. Phone number (503) 357-2110.

a. PVC Hub: ASTM D3034 SDR 26
b. Gaskets: ASTM F477
c. Band: 301 SS
d. Rubber Sleeve: ASTM F477

A. Reinforced Concrete Pipe (RPC)
1. Mastic Joint

2. ASTM C-76

B. SANITARY SEWER SERVICES

1. Polyvinyl Chloride (PVC) ASTM D 3034 SDR 26; bell and spigot for elastomeric gasket joints
   a. Minimum SDR rating 26 (SDR-26).
   b. Fittings: Same as Pipe
   c. Joint connections: push on, elastomeric gasket type conforming to ASTM D 3212.
   d. Gaskets: ASTM F 477 elastomeric seal

PART 3 EXECUTION

3.1 INSTALLATION

A. Pipe shall be installed in accordance with the plans and above-referenced specifications except as modified below.

B. Installation shall be in accordance with manufacturer's instructions.

C. Protection for pipe installation shall be included in the Contractor's Base Bid.\

D. The installation contractor shall employ the services of a Field Representative from the pipe manufacturer for Sewer Pipe 48" and over and the 30" Forcemain Pipe. This representative shall be an employee of the pipe manufacturer and be experienced in all phases of pipe handling and installation. The representative shall make an initial visit to the jobsite before installation begins to provide training to the contractor's personnel and any representatives of the Owner and Engineer. This training shall cover the following topics as a minimum:

1. Proper unloading and handling techniques for pipe
2. Proper storage procedures
3. Cleaning and lubricating the joint rings
4. Placement of rubber o-ring gasket onto spigot ring
5. Pipe jointing procedures
6. Restrained joint assembly procedures
7. Deflecting joints
8. Procedures for air testing of joints (as applicable)
9. Diapering and grouting procedures (as applicable)
10. Bedding and backfill techniques
11. The pipe manufacturer's Field Representative shall be present during initial pipe installation to assist the contractor as needed and observe pipe handling and installation procedures and to provide guidance/recommendations. After this initial jobsite visit, the pipe manufacturer shall make this representative available on an as-needed basis throughout the full term of the field installation when requested by the contractor, Owner, or Engineer.
12. The above Field Representative services shall be included in the base bid price. A summary report of field conditions, instruction and guidance provided, findings and photographs shall be provided for each site visit performed for submission to the Engineer and Owner.

3.2 EXISTING UTILITIES

A. Joint Utility Location Information for Excavators: Call the toll-free J.U.L.I.E. telephone number, 1-800-892-0123, before starting excavation. Allow 48 hours for other than emergency assistance.

B. The Contractor may cross utility lines (gas, fiber optic, telephone, electrical, water, sewer) at various locations shown on the plans. The Contractor shall notify the utility at least 72 hours prior to making this crossing so that they may furnish an inspector during the period of the crossing. It shall be the responsibility of the Contractor to make the necessary provisions to protect these lines from any damage due to his operations. No extra compensation will be allowed for these crossings.

3.3 RIGHT-OF-WAY

A. Working Right-of-Way: The Contractor shall confine his operations to the limits of the working right-of-way shown on the plans and is solely responsible for any damage to adjacent property not within the limits of the right-of-way. Work on Railroad Property indicated on the plans is not allowed or track R.O.W. beyond the offset or R.O.W. limits.

3.4 FIELD QUALITY CONTROL

A. All pipe shall be tested.

1. Sewers: Per Section 31-1.12 and 1.13 of the Standard Specifications

a. Exfiltration of water or infiltration of water
b. Televised with tape supplied to owner
c. Air testing of individual (testable) joints may be allowed for AWWA C-301 pipe, in lieu of the infiltration/exfiltration test.

C. Pressure and Leakage Testing of Force Mains and Water Mains

1. The hydrostatic pressure shall be 1.5 times static pressure or 150 psi (1,050 kPa) whichever is greater for at least a two-hour duration and not vary more than 5 psi (35 kPa).

D. All manholes shall be leakage tested per ASTM C 1244-93 “Standard Test Method for Concrete Sewer Manholes by the Negative Pressure (Vacuum) Test,” Vol. 04.05, Chemical Resistant Materials, Vitrified Clay, Concrete, Fiber-Cement Products; Mortars; Masonry (1996 or latest edition). Manholes will not be vacuum tested until all adjusting rings and the manhole frame are installed, otherwise the test will not be considered valid. Final test should be done with manhole backfilled. Contractor may run other vacuum tests prior to backfilling if they are concerned about passing the test, but they are not required.

E. Construction Observation and Inspection: Owner will employ a qualified engineering agency to perform construction observation and inspection.

3.5 CLEANUP

A. Excess Excavation: All excess excavated materials shall be come the responsibility of the

Contractor for distribution on site per the site grading plan or disposal off the construction site. The Owner's Representative reserves the right to have selected excavated materials deposited at designated locations within the project site area at no additional cost to the Owner.

3.6 PERMITS

A. Comply with requirements of the Railway Crossing Permit (Appendix A) for the Combined Sewer Interceptor Construction.

END OF SECTION 43 13 13

DIVISION 43 – PROCESS EQUIPMENT
SECTION 43 24 13 – VERTICAL TURBINE PUMPS

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the contract, including General Conditions, Special Provisions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

A. This section includes furnishing vertical turbine open line-shaft pumps at the following locations and with the following parameters:

1. Low Service Pumps:
   i. Location: Low Service Pump Station in Process Building
   ii. Quantity: Three (3)
   iii. Flowrate: 900 Gallons Per Minute (min. each pump)
   iv. Total Dynamic Head (TDH): 55 feet

2. High Service Pumps – A:
   i. Location: Plant Process Building
   ii. Quantity: Two (2)
   iii. Flowrate: 900 Gallons Per Minute (min. each pump)
   iv. Total Dynamic Head (TDH): 225 feet

3. High Service Pumps – B:
   i. Location: Plant Process Building
   ii. Quantity: One (1)
   iii. Flowrate: 1350 Gallons Per Minute (min.)
   iv. Total Dynamic Head (TDH): 220 feet

4. High Service Pump – Trimble:
   i. Location: Plant Process Building
   ii. Quantity: One (1)
   iii. Flowrate: 300 Gallons Per Minute (min.)
   iv. Total Dynamic Head (TDH): 300 feet

5. Backwash Pumps:
   i. Location: Plant Process Building
   ii. Quantity: One (1)
   iii. Flowrate: 2300 Gallons Per Minute (min.)
   iv. Total Dynamic Head (TDH): 35 feet.

B. The manufacturer shall supply the pumps and all necessary appurtenances, accessories and fittings for complete dry pit installation in the locations, orientation, configuration and elevations shown on the Plans.

C. Related Sections: The following section contain requirements that relate to this section:

1. Division 01 – General
2. Division 16 – Electrical
3. Division 40 – Process Interconnections
4. Division 46 – Water and Wastewater Equipment

1.3 SUBMITTALS

A. General: Submit the following in accordance with conditions of Contract and Specifications.

B. Product Data: Provide manufacturers literature and data for all components and accessories.

C. Supplier or Manufacturer Certification: At the time of equipment shop drawings submittal, the Contractor shall submit a certificate from the supplier or manufacturer stating the following:

1. The equipment meets the Specifications or stating the variance between that specified and that being offered.

2. The equipment can be installed and will operate satisfactorily in the location as shown on the plans or stating the changes that must be made so that it can be installed.

3. Guaranteeing to make any necessary revisions or replacement of the equipment if it is determined after initial start-up that it will not meet the intent of the Specifications.

D. Shop Drawings: Submit shop drawings showing the dimensions and essential details required to locate and install the pumps and accessories, including:

1. Performance Curves, on the Drawings.
2. Complete Material Specifications.
3. Construction drawings showing complete installation dimensions and clearances, anchor bolts, flange details and accessories.
4. Weights

E. Manufacturer’s installation instructions, installation and startup manuals, installation templates.

F. Operation and Maintenance Manual: The Manufacturer shall submit two (2) complete copies of an Operation and Maintenance Manual compliant with Specification Section 01 33 00.

G. Factory Testing: The Manufacturer shall test the equipment to ensure proper operation and completeness of all interrelated components prior to delivery. The Manufacturer shall provide the Owner complete written results of the factory testing, certifying that the equipment operates according to specified conditions.

H. Verify all equipment, dimensions and clearances for the proposed equipment location shown on the Plan Drawings prior to shop drawing submittal. Any discrepancies or conflicts shall be brought to the immediate attention of the Engineer.

PART 2 PRODUCTS

2.1 GENERAL DESCRIPTION

A. Pump shall have the following criteria:

1. Vertical turbine open line-shaft pump with lubrication
2. Bowl assembly
3. Column assembly
4. Suction can (where applicable)
5. Discharge head and driver. Discharge head shall be designed to carry the entire weight of the bowl and column assembly along with the specified driver without excessive vibration or noise

B. Certifications
1. The pump manufacturer shall be certified to the ISO 9001 standard for design and manufacture of vertical turbine pumps.
2. The manufacturer shall be capable of producing vertical turbine pumps certified to NSF/ANSI 61 & 372.
3. Pressure containing fabrications shall be welded only by those who are qualified on ASME code section IX. Welder certification shall be provided with the submittal package.

C. Electrical motor control centers are specified in Division 16 – Electrical of these specifications.

D. All surfaces, other than stainless steel, to be factory finished per Specification Section 09 90 00.

2.2 ACCEPTABLE MANUFACTURERS

A. Gould’s Water Technology, by Xylem
c/o Layne Christensen (502) 585-1241
1. Low Service Pump model: 12RJLC, 1-stage
2. High Service Pump A model: 12RJLC, 4-stages
3. High Service Pump B model: 12RJHC, 4-stages
4. High Service Pump Trumble: 11RALC, 6-stages
5. Backwash Pump Model: 16RGLXC, 1-stage

B. Or approved equal.

2.3 PERFORMANCE REQUIREMENT

A. The pumps shall be designed for continuous operation. **Motor nameplate horsepower not to be exceeded by power requirement of the pump at any point on the performance curve.**

2.4 CONTROLS

A. Each pump shall operate based on the control philosophy described in Division 40 – Process Interconnections. but generally based on the following controls:

1. Low Service Pumps:

a. Based on liquid level determined by wet well level transducer

b. Backup float

2. High Service Pumps:

a. Based water levels at the towers.

b. Based on localized discharge pressure readings.

3. Backwash pumps:

a. Need based as manually determined by the operator

b. User inputted time interval.

2.5 MATERIAL/CONSTRUCTION

A. General:

1. Bowl Assembly

a. The suction bell shall be designed to provide conservative entrance velocities and direct the flow to the first stage impeller. The inner surface of the suction bell shall be smooth and free of sharp projections which could cause turbulence or cavitation. The suction bell shall be designed to house the suction bell bearing by means of four vanes.
b. The bowls shall be smooth and free of sharp projections and shall have register fits for alignment and be connected by flanged and bolted construction. Bowl sizes 6" to 15" shall be porcelain enameled on the bowl interior. Bowl sizes 16" and larger shall be epoxy-lined.
c. The impellers shall be machined and finished smooth to insure proper performance. They are to be balanced prior to assembly.

2. Column Assembly

a. The column shall include threaded connections and shall be of open lineshaft design with product lubrication.

b. The bearing spacing shall be selected to insure operation at a minimum of 25% above or below the first critical speed. Bearing spacing shall not exceed 5 feet.
c. The interior of the column shall be free of offsets, burrs, discontinuities and irregularities.
d. The lineshaft shall be of adequate size to transmit the full power of the pump without slip, excessive vibration or elongation, and shall have threaded joints. Lineshaft lengths shall not exceed 10 feet. The lineshaft shall have left hand threads that tighten during pump operation.

3. Discharge Head Assembly

a. The Discharge head shall be fabricated steel type L for canned pumps. DI Steel type L for wet well pumps.
b. For above ground service, the discharge head shall be fitted with a flanged discharge connection. The flange shall be a 150 LB R.F. ANSI flange for fabricated steel heads. The discharge head shall be designed to carry the entire weight of the complete pump and driver without distortion when spanning an opening of sufficient size to permit removal of the complete pump assembly. The discharge head shall be provided with a coupling guard. Lifting lugs shall be provided as standard.

4. Driver

a. The driver will be a VHS electric motor. The driver and any related equipment shall ship unmounted from the pump.

5. Can

a. The can diameter shall be sized such that the velocity in the can does not exceed the standards recommended by the Hydraulic Institute. The suction can shall be supplied by the manufacturer.

6. Coating

a. The bowl assembly exterior shall be coated with Tnemec 21 (NSF 61); minimum dry film thickness 8 mils.
b. The column assembly interior and exterior shall be coated with Tnemec 21; minimum dry film thickness 8 mils.
c. The head assembly interior and exterior shall be coated with Tnemec 21; minimum dry film thickness 8 mils.
d. The suction can interior, and exterior shall be coated with Tnemec 21; minimum dry film thickness 16 mils.

7. Testing

a. All factory testing shall conform to the most current edition of the Hydraulic Institute Standards. All pump performance testing shall be performed at the manufacturer’s facility.
b. Performance testing shall be non-witnessed and performed on the fully assembled unit with lab motor. The test shall cover seven points including the

design point (HI 14.6). The design point shall be used for any performance evaluation.

c. Hydrostatic testing shall be non-witnessed in compliance with HI14.6. Hydro testing is to be performed on the pressure containing components. Certified test results shall be provided for approval prior to shipment.
d. A standard 10 business days' notice shall be given to the engineer before starting any witness testing. The manufacturer shall not be responsible for expenses including, but not limited to travel, food, and lodging to observe all witness testing.
e. A written approval for all witness testing is required prior to release for shipment. All non-witness testing shall require no written approval prior to release for shipment.
f. Field/functional testing will be performed by the contractor to insure proper mechanical operation at the jobsite. All testing data to be used for evaluation shall be performed at the pump manufacturer's facility.
g. Motor tests and test reports shall be provided as required in accordance with the motor specification.

B. High Service Pumps:

Part Name	Material	ASTM
Head Assembly		
Headshaft	SST 416	A582 S41600
Discharge Head	Carbon Steel Fab	A53
Adjusting Nut	Carbon Steel 1018	A108
Stuffing Box	Cast Iron CL 30	A48 CLASS 30B
Bearing – Seal Housing	Bismuth Bronze	B584 Modified
Split Gland	SST 316	A744M
Packing	Graphite Packing	ML402-99
O-Ring	Nitrile Buna N	D4322
Slinger	Rubber EPDM	D3568
Column Hanger Flange	Cast Iron CL 30	A48 CLASS 30B
Headshaft Coupling	SST 416	A582M
Key - Motor Gib	Carbon Steel 1018	A108
Gland Adjustment Screw	SST 316	A276
Hex Capscrew	SST 316	A276
Column Assembly		

Column Pipe	Sch 40 Black Pipe	A53
Column Coupling	Sch 40 Black Pipe	A53
Lineshaft	SST 416	A582 S41600
Lineshaft Coupling	SST 416	A582M
Bowl Assembly		
Bowlshaft	SST 416	A582 S41600
Discharge Bowl	Cast Iron CL 30	A48 CLASS 30B
Discharge Bowl Bearing	Bismuth Bronze	B584 Modified
Intermediate Bowl	Cast Iron CL 30 Enamel	A48
Intermediate Bowl Bearing	Bismuth Bronze	B584 Modified
Impeller (1,350 GPM Pump)	SST 316	A744M
Impeller (900 GPM Pump)	Silicone Bronze C87610	B584
Impeller Taperlock	SST 416	A582M
Suction	Cast Iron CL 30	A48 CLASS 30B
Suction Bearing	Bismuth Bronze	B584 Modified
Sandcollar	SST 304	A744M
Pipe Plug	Malleable Iron	A197
Hex Capscrew	SST 316	A276
Can Assembly		
Suction Can	Carbon Steel Fab	A53
Hex Capscrew	SST 316	A276

C. Backwash Pumps:

Part Name	Material	ASTM
Head Assembly		
Headshaft	SST 416	A582 S41600
Discharge Head	Carbon Steel Fab	A53
Adjusting Nut	Carbon Steel 1018	A108

Stuffing Box	Cast Iron CL 30	A48 CLASS 30B
Bearing – Seal Housing	Bismuth Bronze	B584 Modified
Split Gland	SST 316	A744M
Packing	Graphite Packing	ML402-99
O-Ring	Nitrile Buna N	D4322
Slinger	Rubber EPDM	D3568
Column Hanger Flange	Cast Iron CL 30	A48 CLASS 30B
Headshaft Coupling	SST 416	A582M
Key - Motor Gib	Carbon Steel 1018	A108
Gland Adjustment Screw	SST 316	A276
Hex Capscrew	SST 316	A276
Column Assembly		
Column Pipe	Sch 40 Black Pipe	A53
Column Coupling	Sch 40 Black Pipe	A53
Lineshaft	SST 416	A582 S41600
Lineshaft Coupling	SST 416	A582M
Bowl Assembly		
Bowlshaft	SST 416	A582 S41600
Discharge Bowl	Cast Iron CL 30	A48 CLASS 30B
Discharge Bowl Bearing	Bismuth Bronze	B584 Modified
Intermediate Bowl	Cast Iron CL 30 Epoxy	A48
Intermediate Bowl Bearing	Bismuth Bronze	B584 Modified
Impeller	SST 316L	A743
Impeller Taperlock	SST 416	A582M
Suction	Cast Iron CL 30	A48 CLASS 30B
Suction Bearing	Bismuth Bronze	B584 Modified
Sandcollar	SST 304	A744M
Pipe Plug	Malleable Iron	A197
Hex Capscrew	SST 316	A276

Can Assembly		
Suction Can	Carbon Steel Fab	A53
Hex Capscrew	SST 316	A276

A. Low Service Pumps:

Part Name	Material	ASTM
Head Assembly		
Headshaft	SST 416	A582 S41600
Head - Discharge	Ductile Iron 65-45-12	A536
Nut - Adjusting	Carbon Steel 1018	A108
Box - Stuffing	Cast Iron CL 30	A48 CLASS 30B
Bearing - Seal Housing	Bismuth Bronze	B584 Modified
Gland - Split	SST 316	A744M
Packing	Graphite Packing	ML402-99
O-Ring	Nitrile Buna N	D4322
Slinger	Rubber EPDM	D3568
Coupling - Headshaft	SST 416	A582M
Key - Motor Gib	Carbon Steel 1018	A108
Screw - Gland Adj	SST 316	A276
Capscrew - Hex	SST 316	A276
Column Assembly		
Pipe - Column	Black Pipe Sch 40	A53
Column - Coupling	Black Pipe Sch 40	A53
Lineshaft	SST 416	A582 S41600
Coupling - Lineshaft	SST 416	A582M
Retainer - Bearing	SST 304	A744M
Bearing - Lineshaft	Rubber EPDM	D3568

Bowl Assembly		
Bowlshaft	SST 416	A582 S41600
Bowl - Discharge	Cast Iron CL 30	A48 CLASS 30B
Bearing - Discharge Bowl	Bismuth Bronze	B584 Modified
Bowl - Intermediate	Cast Iron CL 30 Enamel	A48
Bearing - Intermediate Bowl	Bismuth Bronze	B584 Modified
Impeller	SST 316	A744M
Taperlock - Impeller	SST 416	A582M
Suction	Cast Iron CL 30	A48 CLASS 30B
Bearing - Suction	Bismuth Bronze	B584 Modified
Sandcollar	SST 304	A744M
Plug - Pipe	Malleable Iron	A197
Capscrew - Hex	SST 316	A276

PART 3 EXECUTION

3.1 TESTING

A. The manufacturer shall test each pump prior to shipment for compliance with specified performance and ship with each pump a copy of the certified pump test performance.

3.2 EXAMINATION

A. Verify site conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer’s instructions and/or instructions of a competent erection engineer representing the manufacturer supplying the equipment.

B. Sequence installation and erection to ensure correct mechanical connections are achieved.

C. Metallic (excluding copper, and stainless steel) piping, fittings, supports, stands, valves and accessories to be painted per Specification Section 09900.

3.4 STARTUP SERVICE/CERTIFICATION

A. Manufacturer shall provide equipment field service engineer for a period of three (3) trips of 2 day each at a minimum.

B. The manufacturer's field service engineer shall assist in questions and clarification regarding equipment installation, provide initial startup certification, initial system operating adjustments and complete system check out. Provide instruction of operating personnel in all necessary operating and maintenance procedures including a step-by-step review of the operations and maintenance manual.

C. The manufacturer shall provide written reports covering the technician's findings and installation certification/approval shall be submitted to the Owner covering the inspection and outlining in detail any deficiencies noted and proposed corrective action of corrective procedures.

3.5 PERFORMANCE GUARANTEE

A. The equipment manufacturer shall warrant operation of the equipment and materials for one (1) year following startup and acceptance with an additional four (4) year prorated warranty after the first year. Equipment process disruptions or failures during the warranty period shall be corrected by the manufacturer.

END OF SECTION 43 24 13

DIVISION 43 – PROCESS GAS AND LIQUID HANDLING, PURIFICATION AND STORAGE
SECTION 43 41 00 – GROUND STORAGE TANK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions, Supplementary Conditions and other Division 01 Specifications Sections apply to this Section.

1.2 SUMMARY

A. This section includes: Furnishing and erecting **Two (2)** steel ground storage tank and interconnecting piping on the New Water Treatment Plant property near Robinson, Illinois, together with all specified appurtenances. The ground storage tank will have 1,000,000-gallon nominal volume, each. This item will be furnished and installed, complete in place, including foundations, painting and site work as specified as part of the **Base Bid.**

B. Start-up service

C. Related Sections included, but may not be limited to:

1. Section 01 11 00 – Summary of Work
2. Section 03 30 00 – Cast-In-Place Concrete
3. Section 09 96 57 – Steel Ground Storage Tank Painting
4. Section 31 23 16 – Excavation
5. Section 31 23 00 – Dewatering and Drainage
6. Section 31 23 23 – Backfill
7. Section 32 05 13 – Soil Materials
8. Section 46 12 00 – Water Main Piping, Valves, Fittings and Accessories
9. Section 46 11 00 – Process Piping, Valves, fittings, and Accessories

1.3 SUBMITTALS

A. General: Submit the following in accordance with conditions of Contract and Specifications.

B. Product Data: Provide manufacturer's literature and data for all components and accessories.

C. With Proposals: Bidder shall submit with his proposal a design drawing showing, the dimensions of the tank including the tank diameter, the height, sizes of principle members, pipes, all plate thicknesses, and all other information to clearly show the construction of the tank on which this bid is based, as well as a sketch of the foundations with dimensions, and estimated amounts of concrete and reinforcing steel which will be required for foundations. Bidder shall also identify the basic design parameters of the foundation system.

D. Shop Drawings: Submit shop drawings showing the dimensions and essential details required to furnish and construct the ground storage tank at the location shown on the Plans. All plate thickness and welding requirements shall be shown.

E. Manufacturer's installation instructions.

F. Operation and Maintenance Manual: Submit the Operation and Maintenance Manual in accordance with Section 01 32 16. This Manual shall contain the recommended operating parameters, recommended maintenance items, operational features and equipment provided and identify the specific protective coatings utilized.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with the requirements of the latest edition of the following:

1. The materials, design, fabrication and erection of the ground storage tank shall conform with the "Standard for Welded Steel Tanks for Water Storage," D100-11 of the American Waterworks Association as modified by these Specifications.

2. Safety requirements: OSHA 29 CFR Part 1910, Occupational Safety and Health Standards, General Industry Standards.

1.5 WARRANTY REQUIREMENTS

A. All equipment, unless otherwise stated, shall be warranted by the manufacturer for 12 months from date of start-up not to exceed 18 months from date of shipment.

1.6 INFORMATION FURNISHED BY OWNER FOR GROUND STORAGE TANK

A. The initial following paragraphs bear the same designation as the Forward to the AWWA Specification D100-11, Paragraph III.A.2, titled “Information to Be Furnished by Purchaser for a Standpipe or Reservoir”. Additional requirements are specified thereafter.

1. Revision that applies: AWWA D100-11.

2. NSF/ANSI 61 Drinking Water System Components – Health Effects compliance is required.

3. Capacity and Diameter: 1,000,000 U.S. gallons and 67’ nominal diameter as shown on the plans.

4. Top capacity level (TCL) to be approximately 40.0 feet (Elevation **520.00**). BCL Elevation = **480.00**.

5. Roof type, pitch and extension shall be as shown on the plans and constructed as a self-supporting knuckle umbrella style with fully seal welded.

6. Time of Completion: Refer to Agreement

7. Nearest Town: Robinson, Illinois

8. Railroad Siding: None.

9. Road Access to Site: Route 1.

10. Electric Power: Electrical power to be furnished by the Contractor and/or Equipment Supplier

11. Compressed Air: Compressed air to be furnished by the Contractor and/or Equipment Supplier.

12. Details of welded joints: AWWA D-100, Section 1.3 – not required.

13. Mill Test Reports Required, AWWA D-100 Section 2.1 – not required.

14. Federal, State, or local requirements: FAA has not been contacted; contractor shall file for any temporary construction facilities required. State IEPA Construction permit has been applied for. The Owner/Engineer will obtain any necessary local permitting.

15. Fluid Conductor Pipe: The inlet and outlet pipes penetrating the floor plate shall be ASTM A53, Type E or S, grade B steel with welded joints and flanged connection with dissimilar metal isolated stainless-steel bolts to the ductile iron connecting pipe. The welded steel piping shall be provided with a fusion bonded epoxy coating on the interior and exterior of the pipe in conformance with AWWA C213 at a minimum of 12 mil dry film thickness.

16. Snow Loading: Design snow load shall be 25 psf.

17. Wind Conditions: The specified D100 wind load conditions shall apply. The wind velocity shall be calculated using no less than 100 mph.

18. Corrosion Allowance: None

19. Roof and Access Manways: shall be provided to provide access to the tank interior in two (2) locations on the sidewall and one (1) on the roof. Handholds shall be provided to improve access capabilities **AT ALL** manhole locations – inside and out. Hatch stops (bumpers) shall be provided on all hinged manholes to prevent damage to the coating system. Spring-assisted hatches, particularly where significant lifting weight is involved, will be favorably reviewed. Roof Manhole frames must be at least 4-inches tall above surfaces at the opening and fitted with a solid water-tight cover which overlays the framed opening and extends down around the frame at least 2-inches. The roof hatch into the wet area shall have a locking device that can be pad-locked to restrict access. Sidewall manholes shall be davit-mounted for ease of handling.

    Additional Accessories: Reference Item 2.2 below for additional requirements.

20. Piping and all connections shall be furnished and installed as shown on the plans and as specified. The transition from steel to ductile shall occur approximately 5 feet outside the edge of the tank foundation at a flanged connection with dissimilar metal isolated stainless-steel bolts.

21. With the silt stop removed, the outlet shall be flush with the tank floor, allowing the tank to drain as much as possible through the adjacent flush hydrant. The tank BCL Elevation = 480.00. A silt stop is required on the outlet piping at a height of 4-inches above the floor of the tank.

22. Removable silt stop is required on the outlet pipe.

23. Overflow Type: Overflow shall be provided to a splash block as shown on the plans. The maximum discharge rate will be 2,400 gpm. The end of each tank overflow pipe shall be covered with both corrosion-resistant No. 4 and 24 mesh, downturned and at 2 ft. above the splash block. The overflow pipe shall be designed (sloped) to prevent freezing.

24. Ladders, hatches, walkways, platform and handrail shall meet or exceed the minimum requirements of OSHA 29 CFR Part 1910. A single roof handrail rather than a ladder will be required to provide access to roof hatches and vent.

25. Tank vent(s) shall be screened in accordance with IEPA regulations against insects, thereby require pressure-vacuum venting or a separate pressure-vacuum relief mechanism in accordance with AWWA D-100, Section 7.5. The screen shall be constructed of non-corrodible No. 16 mesh. The tank vent shall be designed to prevent freezing and entrance of rainwater. The vent shall be adequately sized to vent each tank at a maximum inflow rate of 2400 gpm and outflow rate of 2,700 gpm. **Sizing calculations shall be provided.** Vent may serve as painter's vent hatch.

26. Additional Accessories: As listed in Part 2.2 of this Section.

27. Welding Procedure Specifications, AWWA D-100 Section 8.2.1.5 – shall be provided.

28. Butt-Joint Welds, Section 8.4.2 – shall be performed in accordance with this section. Complete joint penetration is not required on butt-joint welds subject to secondary stress at joints in base metals of thicknesses greater than 3/8 inch.

29. Seal Welding Requirements: All interior components including hatches, manholes, lapped roof, rafters and floor plates, ladder and accessories shall be seal welded as a minimum.

30. Shop Inspection - Shop Surface Preparation/ Prime Coating: The Owner or their Representative may perform shop visits during the scheduled time that the major tank components will be cleaned and primed. Preliminary notice shall be provided two weeks in advance with 48-hour confirmation.

31. Written Report Certifying Welding Work, Section 11.2 - prepare and submit. The Constructor shall submit a written report prepared by qualified personnel, certifying that the work was inspected as set forth in the D100 Specifications. Such report shall be prepared by a third party, independent of the erection foreman's jurisdiction. A summary of inspection of radiographs and sectional segments and inspections by arc gouging, if used, shall be provided to the Owner. Items 1, 3, 4 and 5 of D100 Section 11.2 are not required.

32. Radiographic film and inspection reports, Section 11.2 – provide radiographic films, identified to plate diagrams at completion of the Work with O&M Manuals.

33. Protective Coatings – reference Section 09 96 57 – Steel Ground Storage Tank Painting.

34. Soil Investigation, Section 12.2.1: Reference the Supplementary Conditions. The subsurface exploration report was prepared for the use of the Owner and Engineer. Floor plates shall be laid on a clean sand cushion. The Constructor shall bear all responsibility for foundation selection, design and any modifications made to such. Detailed foundation plans shall be furnished by the Constructor and submitted to the Engineer for review within 45 days of the Notice to Proceed. Plans shall be signed and sealed by an Illinois Licensed Structural Engineer. The seismic importance factor is 1.25 (Seismic Use Group III) per Section 13.2, Table 24. The top of foundation shall be 6-inches above finished grade per AWWA D-100 Section 12.7.1.

35. Pile – Supported Foundation – not applicable.

36. Buoyancy, AWWA D-100 Section 12.7.4 – ground water elevation shall be considered at elevation 480

37. ACI 301, Specifications for Structural Concrete for Buildings – reference Section 03300 Cast-in-Place Concrete as well as Section 12.8.1 of D100-11. Any small holes within 12-inches of the ground surface shall be mortared to a smooth finish (deviation from Section 12.8.2).

38. Earth Cover: earth cover shall be as shown on the plans. Insulation and coverings for pipe placed with less than 5.0 feet of earth cover shall be provided where noted on the plans.

39. Seismic Use Group, AWWA D-100 Section 13.2.1 – Group III.

40. Site-Specific Procedure (Seismic), AWWA D-100 Section 13.2.8 – not required.

41. Seismic Design of Roof Framing and Columns, AWWA D-100 Section 13.5.4.5 – not required.

42. Section 14 Tank Design – not applicable.

43. Section 14 Tank Certified Welding Inspection – not applicable.

44. Third-Party Inspection – shop inspections are not anticipated. Field inspection of the foundation, plate steel, welding, surface preparation, and painting operations will be performed by both the Owner and their Representative or Engineer. Special attention must be paid to ladder welding in the shop prior to shipment. Plates found with pitting, scabs, or delaminations will be rejected.

45. Steel Pitting Tolerances:

    a. For steel less than ½-inch thick, a pit depth of no greater than 0.012 inches shall be allowed.

    b. For steel greater than or equal to ½-inch thick, a pit depth of 0.014 inches shall be allowed.

1.7 DEVIATIONS FROM D-100 APPENDIX B – DEFAULT CHECKLIST

A. The following Defaults are hereby modified.

1.	5.2.1	Removable Silt Stop: is required.
2.	5.6	Loads from antennas and related equipment shall be considered in the design of the tank, support structure, and foundation equivalent to a directional Yagi antenna and a dual-mast telecommunications carrier.
3.	7.2.1	Removable silt stop: is required.
4.	7.3	Overflow outlet: the outlet shall be flanged and covered with both #4 and #24 corrosion resistant screen and either (A) flap valve or (B) Red Valve Series 35-1 Duckbill Check Valve (TF-1).
5.	7.6	Loads from antennae and related equipment: shall be considered in the design of the tank, support structure, and foundation equivalent to a directional Yagi antenna and a dual-mast telecommunications carrier.
6.	8.14.2	Seal welding: is required as noted in Item 1.6, A, 31.
7.	12.6.1	Grout: shall be non-shrink, non-metallic commercial grout.

1.8 WORKING DRAWINGS

A. After contract award and prior to construction, the Contractor shall provide engineering drawings and design calculations for the steel tank and the foundation. Drawings shall show the size and location of all structural components and the foundations along with reinforcement details, the required strength and grade of all materials and the size and arrangement of principle piping and equipment. The drawings and calculations shall bear the certification of a Professional Engineer licensed in the State of Illinois. The design coefficients and resultant loads for snow, wind and seismic forces, and the methods of analysis shall be documented.

PART 2 PRODUCTS

2.1 GROUND STORAGE TANK

A. Manufacturer:

1. Fisher Tank (Chester PA).
2. Caldwell Tanks Inc. (Louisville, KY)
3. Maguire Iron, Inc. (Sioux Falls, SD)
4. Chicago Bridge and Iron (Woodland, TX)
5. or equal

2.2 ACCESSORIES

A. All accessories shall be furnished in accordance with AWWA Specifications and/or referenced codes.

B. Roof Access Hatches (2): One 30-inch circular steel, lockable located near the tank side shell. A second 30-inch hatch shall be provided for painter's access and may be adapted for use as the tank vent. All ladders, hatches, walkways and handrails shall meet or exceed the minimum requirements of OSHA 29 CFR Part 1910. **Handholds** shall be provided adjacent to the roof hatches to aid access to the tank interior. The frame shall be 4-inches to 6-inches above the roof with a downward cover overlap of 2-inch minimum. Hatches shall be equipped with hinges and bumpers/stops or heavy-duty stop-chains to limit coating damage.

C. Roof Ventilator: minimum of 24-inch diameter, with 30-inch opening with No. 16 non-corrodible insect screen. Vent may function as painters vent as well, allowing a fan to bolt to the flanged and gasketed connection. Reference Item 1.6, A., 27 for sizing/flow requirements.

D. Exterior Ladder: A steel ladder from eight (8) feet above the top of foundation to the top of the tank at the roof access hatch shall be provided. The ladder shall extend four feet above the tank top and there will be a 48-inch-high handrail between the ladder and the roof hatch access. The exterior ladder shall be equipped with a folding, hinged, locking aluminum ladder guard to prevent unauthorized access.

E. Harness and Ladder Safety System: The ladder safety system shall be a tensioned 3/8-inch diameter stainless steel cable attached to a shock absorbing top bracket. Manufacturer shall furnish intermediate cable guides for continuous use every 30 ft to prevent metal-to-metal contact with two (2) detachable safety sleeves that connect directly to the harness. Universal rung clamps shall be stainless steel. The safety system is required on the exterior ladder. Ladder safety system shall be DBI SALA LAD-SAF Vertical Fall Arrest System or approved equal.

F. Manways: Two **(2) 30-inch** shell manholes shall be provided, equipped with davits or hinges, located near the base of the tank. One of these manholes shall have a bolting flange suitable for connecting an exhaust fan for ventilation. Handholds mounted inside and outside the tank shall be provided to aid access at all manway locations. Manway shall be secured with stainless steel nuts and bolts with dissimilar metal isolation after tank painting.

G. Cathodic Protection System: not applicable.

H. Transition Platform: provide a transition platform between the handrail and the exterior ladder at the roof /shell connection.

I. Flush Hydrant: See Specification 33 11 00 Part 2.8

J. Antennae Mounts: Two (2) antennae mounts shall be provided on the roof of the ground storage tank as shown on the Plans. The mounts shall be 48 inches x 2 inch Sch. 80 steel pipe and ¼" steel plate at a minimum, seal welded and capped with 6-inch tall minimum reinforcing gussets to stabilize the pipe to the roof plate. Conduit attachment tabs shall be welded to the tank on 10-foot centers adjacent to the tank access ladder. Antennae mounts shall be located within 9-feet of center of the tank roof.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions.

3.2 WORKMANSHIP

A. All workmanship shall conform with AWWA D100-11.

3.3 FABRICATION, ERECTION AND PAINTING

A. Contractor shall fabricate and erect equipment with its own forces. Field erection crews shall have demonstrable experience erecting the tank to be provided. Erection by subcontractors having no previous experience erecting the tank will not be allowed. Welding procedures and welders shall be certified per applicable standards in this Specification.

B. Install tank and tank foundations in accordance with AWWA D100 and all local, County, State, and Federal requirements.

1. AWWA D100, Section 10 – Erection: Constructor shall fabricate and erect the ground storage tank with its own forces. Field erection crews shall have demonstrable experience erecting the style, size and height of tank required.

   Erection by subcontractors will not be allowed.

C. All weld spatter, burrs and slag shall be removed by chipping, grinding or brushing.

D. Painting: Reference Section 09 96 57.

E. Disinfection by Tank Contractor: Reference Section 09 96 57.

3.4 STARTUP SERVICE/CERTIFICATION

A. Check out by manufacturer upon completion.

B. Contractor shall certify to the Engineer that tank has been fabricated and installed in accordance with Specifications.

C. Contractor shall include with his bid the services of the manufacturer's field representative a minimum of two (2) trips of one (1) day each. The first trip shall be just prior to placing the tank on-line to verify that all components are suitable for continuous usage. The last trip shall be 11 months after acceptance of the tank to verify that the tank is operating and performing as designed. The condition of the protective coating system will be checked at this time as well. Contractor shall provide written reports stating the findings of each trip. Defects shall be repaired at no expense to the Owner.

3.5 PERFORMANCE GUARANTEE

A. Contractor shall warrant equipment, installation and painting for one year following Owner acceptance. Equipment and paint failures during warranty shall be corrected at Contractor's expense.

3.6 FIELD QUALITY CONTROL

A. Inspection and Testing:

1. Testing shall be in accordance with D-100, Section 11.10:

a. Flat bottom tanks shall be tested in accordance with Section 11.10.1.

b. The shell-to-bottom joint shall be tested in accordance with Section 11.10.2.

c. Test completed and cleaned tank for liquid tightness by filling tank to its overflow elevation with water **provided by Owner** in accordance with Section 11.10.3.

d. Correct leaks disclosed by this test.

e. Drain and legally dispose test water off site if necessary.

2. Field and Shop Welds: Tested and inspected in accordance with AWWA D100, Section 11.4 – Inspection of Welded Joints. All weld spatter, burrs and slag shall be removed by chipping, grinding or brushing leaving a paintable surface. Special attention shall be paid to overhead and ladder welding. Improperly performed Shop Welds shall be corrected in the Field.

3. Concrete testing for foundation in accordance with Section 03 30 00.

3.7 MANUFACTURER'S FIELD SERVICES

A. Furnish field representative experienced in installation of tank to supervise installation.

1. Furnish Installation Certificate attesting tank and its foundation are properly installed and its foundation are properly installed and leveled.

2. Manufacturer shall certify to the Owner that the tank has been fabricated and installed in accordance with the Specifications.

3.8 CLEANING

A. Section 01 70 00 – Contract Closeout: Requirements for cleaning.

1. Clean interior and exterior of tank to remove debris, construction items, and equipment.

2. Clean the site of debris, including welding rods, rope, tape, cable, etc. when each crew demobilizes from site.

B. Clean and disinfect tanks in accordance with Section 09 96 57.

END OF SECTION 43 41 00

DIVISION 46 - WATER AND WASTEWATER EQUIPMENT
SECTION 46 10 00 - GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Special Provisions and Division 01 Specifications, apply to this section.

1.2 SUMMARY

A. This section includes General Requirements related to all work specified in DIVISION 46 00 00 – PROCESS EQUIPMENT and Section 22 13 13 – Exterior Piping, Valves, Fittings, and Accessories.

B. Related Sections:

1. Section 01 10 10 – Summary of Work Sequence
2. Section 01 14 00 – General Coordination
3. Section 01 33 00 – Submittals
4. Section 01 43 00 – Quality Assurance and Control (QA/QC) Requirements
5. Section 22 13 13 – Exterior Piping, Valves, Fittings, and Accessories
6. Division 26 – Electrical
7. Division 46 – Process Equipment

1.3 REQUIREMENTS

A. Scope of Work: The work to be done under Division 46 and Section 22 13 13 includes the furnishing of all labor, materials, and equipment necessary for the complete installation, erection, testing, and initial operation of all process equipment and accessories as shown on the accompanying drawings and hereinafter specified and listed.

B. General: All parts and units of the water treatment plant equipment shall comply with the sections of the General Specifications describing "Materials and Workmanship," "Guarantee of Materials," and "Or Equal Clause."

Any two or more pieces of equipment or material of the same type, kind or classification, and being used for identical types of services shall be made by the same manufacturer.

Specifications which follow indicate the general spirit and intent of capacity, quality, manufacturer's design, construction and performance expected.

Where manufacturer's trade names for equipment items are included in the specifications, they are included only to serve as an example of the general type, design and performance expected for the equipment for the project under Article 4 of the Bid Form. Each bidder must list one manufacturer for the major equipment proposed to be furnished and installed in the work. The equipment named in the proposal shall be provided unless the equipment is found not to be in compliance with the specifications. This determination will be made after shop drawings are submitted.

Equipment found not to be in accordance with the plans and specifications shall be replaced for with equipment which is in accordance with the plans and specifications at no additional cost to the owner. The bidder to whom the contract is awarded, shall submit shop drawings from the manufacturers indicated and upon satisfactory review by the Engineers, shall order the equipment from the manufacturer.

C. Supplier or Manufacturer Certification: At the time of equipment shop drawings submittal, the Contractor shall also submit a certificate from the supplier or manufacturer stating the following:

1. The equipment meets the Specifications or stating the variance between that specified and that being offered.

2. The equipment can be installed and will operate satisfactorily in the location as shown on the plans or stating the changes that must be made so that it can be installed.

3. Guaranteeing to make any necessary revisions or replacement of the equipment if it is determined after initial start-up that it will not meet the intent of the Specifications.

Additionally, after start-up, the Manufacturer or Supplier shall certify in writing that the equipment has been installed correctly and will operate satisfactorily. Two (2) signed copies of the certification shall be given to the Engineer. The requirements of this paragraph shall apply to each equipment item. Final payment shall not be made until certificates are submitted.

D. Plans: The plans as prepared by the Engineers for this proposed construction are necessarily general in character and, in some respects, are not in elaborate detail due to the character of the improvement, but they are in sufficient detail to give the general layout of the work as contemplated and to show the clearances available for the specified equipment. The Owner, through its Engineers reserves the right to alter the details of the plans upon the selection of the units proposed to be furnished so as to make the same conform to particular dimensions and sizes of the units selected. Any additional construction costs due to the changes in the general design that will be necessary by reason of the type of equipment provided and selected shall be borne by the Contractor, at no expense to the Owner, including the cost of all structural, mechanical, electrical and/or process changes necessary to incorporate the equipment in the work other than that set up in the plans and these specifications.

E. Maintenance: Maintenance Parts shall be provided as listed under various equipment items.

F. Tools: The Contractor shall, unless otherwise stated herein, furnish with each type, kind or size of equipment, one complete set of suitably marked "high-grade" tools, grease guns and fittings, and appliances which may be needed to adjust, operate, maintain or repair the specific equipment. Such specialized tools and appliances shall be furnished in a neat, suitably constructed box. Each piece of equipment shall be provided with a substantial nameplate, securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture, and principal rating data.

G. Lubrication: The Contractor shall furnish all necessary grease and oil for the lubrication of all bearings and other moving parts for the initial operation of all equipment and pumping units

and shall furnish a three (3) month's supply following erection of equipment of the above-mentioned lubricating materials for all items of equipment and pumping units.

H. Operating Instructions: The Contractor shall furnish and deliver to the Engineer, four (4) complete sets of instructions, technical bulletins or additional printed information such as prints, diagrams or drawings containing full information required for the proper operation, maintenance, and repair of the equipment installed. These instructions shall include the necessary information for ordering of additional repair parts, as well as lubrication instructions for all gear reducers, bearings, motors or other moving parts.

I. Anchor Bolts - Pipe Connections - Foundations: The Contractor, unless specified to be provided by the equipment manufacturer, shall furnish all templates, bolts, rods, epoxy set anchor materials, washers, grommets, shims, sole plates, collars and accessories required to anchor the equipment to concrete foundations, floors or other specified locations shown on the plans.

J. Equipment Erection and Installation: The Contractor shall erect all equipment and pumping units at the locations and on the foundations and elevations shown on the plans unless directed otherwise by the Engineer during installation. The Contractor shall erect all equipment and pumping units under the direction or instructions of competent erection engineers representing the manufacturers supplying the equipment and pumping units. The Contractor shall have available sufficient and proper equipment and machinery to facilitate the work and to handle all emergencies normally encountered in work of this character.

The Contractor shall provide, prior to initial operation, the services of the aforementioned erection engineers who shall inspect and check the installation of the equipment and pumping units supplied by their respective firms. All equipment as specified herein shall be erected in accordance with the manufacturer's recommendations or instructions, together with all necessary connections, ducts, and appurtenances required to place the equipment ready for continuous service as shown on the plans and specified herein. In accordance with the equipment manufacturer's representative's recommendations, the Contractor, at his own cost and expense, shall place all parts in careful adjustment and fill all parts requiring lubrication with the proper grade oil or grease ready for continuous service.

K. Final Field Tests: Upon completion of the work and prior to final acceptance, all equipment and pumping units shall be subjected to acceptance tests specified or required to prove compliance with Contract Documents. The Contractor shall furnish labor, fuel, power and all other materials and equipment necessary for all acceptance tests at no additional costs to the Owner. The Contractor shall furnish the services of a competent and experienced factory field service engineer or technician who shall represent the manufacturer of the equipment to be tested and who will inspect, adjust if necessary, and approve the installation if it is proper in his opinion. After the equipment is placed in permanent operation by the Owner, the Contractor shall provide the services of such factory field service engineer or technician who shall make all adjustments and tests required by the Engineer, at no additional cost to the Owner, to prove that such equipment is in proper and satisfactory operating condition.

L. Erection Services of Manufacturer's Representative: Equipment suppliers shall furnish the services of supervisors for erection and final field checks as set out under the individual item.

M. Startup Services/Sequence
Equipment suppliers/manufacturers shall furnish the services of a field service engineer as set out in the individual specification sections. In order to ensure proper startup sequencing and operator training, the following scheduling protocol will be followed:

1. Final Field Checking and Testing of the equipment for correct installation and operation will be performed prior to the equipment being taken on-line (initial startup testing). The final field test services will be scheduled in a sequence suitable for subsequent on-line equipment testing. All equipment will be expected to operate at design performance requirements at initial startup testing.

2. When the equipment is placed in full-service operation, the equipment shall be adjusted and tested as necessary to prove the equipment is in proper and satisfactory operating condition and meeting all design performance requirements. Schedule the on-line operations testing as required for proper plant operation. All equipment will be expected to operate at design performance requirements at full-service operations testing.

3. After Final Field Checking/Testing and Startup Operational Adjustment/Testing, operator training will be conducted as set out in the individual specification items by equipment item in a scheduled sequence. The equipment startup will be defined for contractual warranty purposes as the day following completion of Operator Training and on-line operation of the equipment.

4. All startup service shall be conducted by a qualified, trained and competent factory field service engineer or technician who is regularly engaged in field equipment operations certification, testing and repair. General sales representatives or management personnel not intimately familiar with the equipment components, operational and installation requirements or otherwise not regularly engaged in field installation and on-site operational applications will be rejected.

5. Operator training will be performed with the specified O&M manuals on hand and shall cover all operations, maintenance, service and equipment details as outlined in the O&M manual.

N. Welding: The equipment manufacturer's shop welding procedures, welders and welding operators shall be qualified and certified in accordance with the requirements of AWS D1.0 "Welding in Building Construction" of the American Welding Society. The equipment manufacturer's shop drawings shall clearly show complete information regarding location, type, size, and length of all welds in accordance with "Standard Welding Symbols" AWS A2.0 of the American Welding Society. Special Conditions shall be fully explained by notes or details.

The Contractor's welding procedures, welders and welding operators shall be qualified and certified in accordance with the requirements of AWS D1.0 "Welding in Building Construction" of the American Welding Society. The Contractor shall perform all field welding in accordance with the information shown on the equipment manufacturer's drawings regarding location, type, size, and length of all welds in accordance with "Standard Welding Symbols," AWS A2.0 of the American Welding Society and special conditions as shown by notes and details.

O. Water Treatment Plant Equipment Electrical Requirements: All electrical work and equipment, control panels, controls, provided under this section shall conform to the requirements of Division 26 (Electrical) and as set out under individual equipment item specifications and as shown on the plans.

P. Water Treatment Plant Equipment Controls and Device Integration Work:

1. All plant control, including individual equipment and panel, HMI, and plant SCADA work shall be performed by a single integrator. Approved integrators are:
    i. Engineers Solutions Midwest, Inc. C/O Brian Ealy, (765) 505-2026

Q. Painting: Shop and field painting shall conform to the requirements of Section 09 90 00 and as set out under individual equipment item specifications.

R. Equipment tags for the equipment specified in this Division shall be provided per Division 22 and 23 requirements and the Division 26 and 46 Equipment Schedules.

S. Comply with Section 01 43 00 – Quality Requirements

T. Exercise and maintain equipment as required by the manufacturer from time of installation to time of full-service startup.

U. Substantial Completion:

1. Substantial Completion: Equipment will be completed through Final Field Checking and Testing and Operator Training as stipulated in Section 46 10 00 – 1.3.K and 46 10 00 – 1.3.M.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 46 10 00

SECTION 46 – WATER AND WASTEWATER EQUIPMENT
SECTION 46 10 30 – PROGRAMMABLE LOGIC CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions, and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for programmable logic controllers, operator interfaces, and accessories, including:

1. Power supplies.
2. Chassis.
3. I/O modules.
4. Communication modules.
5. Programming software.
6. Human Machine Interfaces (HMI).

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. All Division 46 – Water and Wastewater Equipment Manufacturer Supplied Equipment Control Panels.
2. Section 46 10 40 – Control Panels, for PLCs provided by equipment manufacturers.

1.3 REFERENCES

A. National Fire Protection Association (NFPA):

1. NFPA 70 – National Electric Code® (NEC).

B. Underwriters Laboratories (UL):

1. UL 486A – Wire Connectors and Soldering Lugs for Use With Copper Conductors.
2. UL 486B – Wire Conductors for Use With Aluminum.
3. UL 508 – Industrial Control Equipment.

1.4 DEFINITIONS

A. HMI: Human-Machine interface.

B. PLC(s): Programmable logic controller(s).

C. SCADA: Supervisory Control and Data Acquisition.

1.5 SYSTEM DESCRIPTION

A. The proposed SCADA system shall be a network of PLCs and personal computers communicating via 10/100 TCP/IP on Ethernet. Personal Computers shall provide HMI display and database capabilities, installed where shown.

B. A minimum of 10% additional assignable input/output points for each I/O type shall be provided for each PLC location.

1.6 SUBMITTALS

A. Product Data:

1. Submit manufacturer's product data sheets for equipment described in Part 2 of this Section including memory size, input and output capacities, and communications capabilities for each processor.

B. Shop Drawings:

1. Submit component dimensional drawings.
2. Submit wiring diagrams detailing wiring for power and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.

C. Maintenance and Operation Instructions:

1. Submit electrical diagrams with information on repair, troubleshooting, and testing. Include operational sequence description as well as programming documentation required in this Section.

D. Project Record Documents:

1. Submit complete programming documentation for each PLC on a Flash-Drive readable media storage device. Documentation shall include fully annotated reports and description comments. Full sequence of operation shall be contained in running comments. Description and reports shall be cross-referenced. All PLC programs shall be provided in electronic RSLogix file format. Each file shall be the complete, modifiable program with no passwords or other restrictions for future access and/or modifications. This includes any code source protections on custom data types, ladder logic, structured text, function blocks, add-on instruction or other code to the program. Any similar restrictions are also not acceptable.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL.
2. Listing and Labeling: Provide electrically operated components specified in this Section that are listed and labeled as defined in the NEC, Article 100.

1.8 PROJECT CONDITIONS

A. The existing treatment plant operations shall be maintained during the installation of the new SCADA system.

1.9 COORDINATION AND SCHEDULING

A. Coordinate the installation of PLCs with the installation of relevant electrical and instrumentation components.

1.10 WARRANTY

A. PLCs and accessories shall be fully warranted for one year after Project acceptance.

PART 2 - PRODUCTS

2.1 PROGRAMMABLE LOGIC CONTROLLERS (PLCs)

A. General: PLC programming software shall be RSLogix 5000 software (or StudioLogix, version dependent) manufactured by Rockwell Automation (Milwaukee, WS), for programming use.

B. Control Panel: ControlLogix Line, (Catalog No. 1756-L71) with Ethernet module (with readable registers for PLC monitoring) manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS).

2.2 ACCESSORIES

A. Control Panel:

1. Analog Input Modules: Catalog No. 1756-IF16 manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS).

2. Analog Output Modules: Catalog No. 1756-OF8 manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS).

3. Discrete Input Modules: Catalog No. 1756-IA16I manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS).

4. Discrete Output Modules: Catalog No. 1756-OW16I manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS).

   Note the output range for each output on this module is 1.5 A @ 120V AC 50/60 Hz. If a load is going to require more than 1.5A @120V then please connect that specific output to an appropriate interposing relay.

5. Power Supply: 1756-PA75 manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS).

6. Chassis: 1756-A17 or 1756-A13 (or 1756: A10, A7, A4) as required manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS).

7. Ethernet Modules: 1756-EN2T manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS).

   Note: One (1) is required for SCADA communication. A second one is required for ethernet based I/O (remote ethernet modules, VFDs, etc.)

8. 36 Pin Screw Clamp Wiring Harness: 1756-TBCH manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS).

9. 20 Pin Screw Clamp Wiring Harness: 1756-TBNH manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS).

10. Empty Slot Filler: 1756-N2 manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all PLCs in control enclosures.

B. Wire all I/O module points to terminal blocks, including additionals. Use spade lugs to connect conductors to the PLCs. Spade lugs shall be Part Number 53120-1 (#22-16 AWG) or Part Number 53123-1 (#16-14 AWG) manufactured by AMP Incorporated (Harrisburg, PA) or equal.

C. For PLC control enclosure wiring and labeling requirements, see Section 461040 - Control Panels.

3.2 CONNECTIONS

A. Drawings indicate the general arrangement of instrumentation and cabling.

B. Electrical: Conform to applicable requirements in Division 26 Sections.

C. Grounding: Connect CPU to frame ground using a green ground wire and grounding bracket. Branch ground conductors to a central earth ground point to ensure no conductor carries current from any other branch. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

END OF SECTION 46 10 30

SECTION 46 – WATER AND WASTEWATER EQUIPMENT
SECTION 46 10 40 – CONTROL PANELS

PART 1 - PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for local control panels (LCPs) and master control panels (MCPs) provided with other equipment or built for this Project by the Electrical Contractor and includes the following:
   1. Enclosures.
   2. Wiring.
   3. Terminal blocks.
   4. Pilot devices.
   5. Panel-mounted devices.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 26 28 16 - Enclosed Switches and Circuit Breakers, for control panel-mounted disconnects.
   2. Section 26 29 13 - Enclosed Controllers.
   3. Section 46 10 30 - Programmable Logic Controllers, for PLCs and operator interfaces.
   4. All Division 46 – Water and Wastewater Equipment Manufacturer Supplied Equipment Control Panels
   5. SCADA Systems Integration (I/O testing and programming) by the Owner's Representative. The Bid Contract is to fabricate, wire and install all control panels and all wiring/conduit between the control panel and remote process sensors. I/O testing (point to point) done in coordination and with the on-site assistance of the Bid Contract Electrician (Base Bid Requirement).

1.3 REFERENCES

A. International Electrotechnical Commission (IEC):
   1. IEC 529 - Classification of Degrees of Protection by Enclosures.

B. National Electric Manufacturers Association (NEMA):
   1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electrical Code® (NEC).

D. Underwriters Laboratories (UL):
   1. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors.

2. UL 486B - Wire Connectors for Use With Aluminum.
3. UL 497A - Secondary Protectors for Communications Circuits.
4. UL 508 - Industrial Control Equipment.
5. UL 1283 - Electromagnetic Interference Filters.
6. UL 1449 - Transient Voltage Surge Suppressors.

1.4 SUBMITTALS

A. Product Data:
   1. Submit manufacturer's product data sheets for equipment described in Part 2 of this Section.
   2. Submit nameplate engraving schedule for each panel.

B. Shop Drawings:
   1. Plans for each control panel are included. Submittals that reproduce original design drawings, re-design original drawings, alter the layout or original design, or make any unapproved change to the provided control panel design plans will not be accepted. Changes to the original design must be submitted to the designing engineer firm (Farnsworth Group) for approval. Approved changes may be made to documentation (drawings, I/O lists, sequence of operations) by either the designing engineering firm or facility systems integrator; electronic copies of files associated with original documentation will be furnished upon request.
   2. Location plan for each control panel with required clearances.
   3. Mounting details including location of anchoring flanges and holes.
   4. Submit wiring diagrams detailing wiring for power and control systems, clearly differentiating between manufacturer- and field-installed wiring.

C. Design Data:

   1. Submit, in tabular form, 120 VAC current load. Load calculations shall demonstrate proper conductor and circuit breaker/fuse sizing.
   2. Submit, in tabular form, 24 VDC current load. Load calculations shall demonstrate proper power supply sizing.

1.5 QUALITY ASSURANCE

A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.

B. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled as defined in the National Electrical Code, Article 100.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions and clearances by field measurements.

1.7 COORDINATION AND SCHEDULING

A. Coordinate the installation of control panels with the installation of relevant mechanical, electrical, and instrumentation components.

PART 2 - PRODUCTS

2.1 PANELS, SUB PANELS, AND PANEL COMPONENTS

A. General: All control panels shall be built using parts as specified on the design plan bill of materials. Deviation from a panel's respective bill of materials on the final design plans will not be accepted.

B. Acceptable Panel Fabricators (for the Control panel drawings I.A to I.Q):

1. Simplex System Controls, 244 William St. Bensenville, IL 60106 (630) 766-8401
2. Durkin c/o Process Control Solutions, 12851 Gravois Rd., Ste 100, St. Louis, MO 63127, (314) 432-2040
3. Wunderlich-Malec, 6101 Blue Circle Drive, Eden Prairie, MN, (630) 827-0200
4. Primex Controls, 22650 County Highway 6, Detroit Lakes, MN 56501 (218) 947-1317

Clarification: Equipment vendor control panels are not required to use any of the Panel Fabricators listed in 2.1.B. This list only applies to Contractor supplied plant SCADA panels.

2.2 CONTROL PANEL ENCLOSURE

A. General: Shall be provided with the following accessories:

1. Door mounted data pocket.
2. Door mounted folding shelf or rack-mounted pullout shelf.

B. Enclosure System manufactured by Hoffman Engineering Company (Anoka, MN) or approved equal.

2.3 ACCESSORIES

A. General: Control shall be provided with the following accessories:

B. Uninterruptible Power Supply: On-line topology UPS unit capable of providing at least 15 minutes of operation for all devices mounted in or powered from the Control Panel. UPS powered devices shall include, but not be limited to, the PLC, Ethernet Switch, 24VDC power supply, and instruments mounted in or powered from the Control Panel. UPSs shall be manufactured by Sola/Hevi-Duty, a Unit of EGS Electrical Group, LLC (Goldsboro, SC), APC (W. Kingston, RI), Powerware, a Division of Eaton (Raliegh, NC) or approved equal.

C. Ethernet Switch: IEEE 802.3 compliant with a minimum of 8 RJ-45 connections.

D. Radio Telemetry (if required) – Equipment required shall be installed in the panel in the space marked “reserved for future radio”. Radio equipment to be supplied by Contractor via Radio System Supplier.

2.4 CONDUCTORS

A. Power Wiring: For AC and DC power and control wiring to components, use #14 AWG (minimum) stranded wire with nylon-jacketed thermoplastic insulation rated for 600 VAC and 90°C. For wiring carrying more than 15 A, use sizes in conformance with NEC.

B. Signal Wiring: Use #18 AWG (minimum) stranded, shielded, twisted-pair insulated wire rated for 300 VAC and 60°C.

2.5 WIRE MARKERS

A. Conductors shall be labeled using smudge-proof pre-printed, mechanically-attached character sleeve markers or pre-printed, full-circle, heat-shrinkable insulating sleeve labels. Sleeve markers shall be Clip-Sleeve™ or Omni-Grip® manufactured by W.H. Brady Company (Milwaukee, WS); or equal. Sleeve labels shall be PermaSleeve™ manufactured by W.H. Brady Company (Milwaukee, WS); or equal.

2.6 TERMINAL BLOCKS

A. General: Terminal blocks shall be DIN rail mounted. Provide additional terminals equal to approximately 20% of the required number of each type of wiring connection.

B. Standard Terminal Blocks: Minimum 6 mm unit with compression clamp, gray in color unless otherwise noted. Standard terminal blocks shall be M 4/6 manufactured by Entrelec Incorporated (Irving, TX), 1492-W4 or 1492-J4 manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS); or approved equal.

C. Fused Terminal Blocks: All PLC Discrete Inputs (DI) and Discrete Outputs (DO) wires shall be landed on Entrelec Fused Terminal Blocks with 2-amp fuses provided. They shall be compression clamp, gray in color unless otherwise noted. Fused terminal blocks shall be M4/8.SFL (#1SNA 115 661 R2100) manufactured by Entrelec Incorporated (Irving, TX).

D. Ground Terminal Blocks: 6 mm unit grounding to the mounting rail, green and yellow in color. Ground terminal blocks shall be M 4/6.P manufactured by Entrelec Incorporated (Irving, TX) or equal.

E. Fuse Holder: 8 mm unit, gray in color unless otherwise noted, with two test sockets and blown fuse indicator (neon for AC, LED for DC) suitable for miniature (5×20 or ¼"×1¼") fuses sized for load. Fuse holders shall be M 4/8.SFLT, M 4/8.SFDT, or M 4/8SFDT1 (Part Numbers 115 667.27, 115 665.25, and 115 666.26) manufactured by Entrelec Incorporated (Irving, TX); Catalog Numbers 1492-H4, 1492-H5, or 1492-H6 manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS); or equal.

F. Analog Terminal Blocks: 6.2- or 9-mm unit, black or gray in color. For 4-20 mA loops, the supply side terminal block (+) shall have an LED indicating current flow and the return terminal block (-) shall have a removable knife disconnect to allow insertion of an ammeter for testing. Analog terminal blocks shall be M 4/9.4AL (Part Number 305 338.14) and M 4/6.SNTA (Part Number 115 466.16) manufactured by Entrelec Incorporated (Irving, TX); UDK 4-ILA 500 (Order No. 27 75 06 1) and UDK 4-MTK-P/P (Order No. 27 75 21 0) manufactured by Phoenix Contact (Harrisburg, PA); or equal.

G. Analog Isolators: Loop powered I/I opto-isolators, UL 508 recognized, minimum 1800 VDC isolation (input to output) with front mounted green LED indicating DC power and input signal status; maximum internal power consumption of 2.5 W. Analog isolators shall be Action I/Q Q408 manufactured by Action Instruments (San Diego, CA.) or equal.

2.7 PILOT DEVICES

A. General: 30.5 mm NEMA 250 Type 4/4X, corrosion-resistant.

B. Selector Switches: Two- or three-position (as required), non-illuminated, maintained position with standard legend plate; contact blocks as required. Selector switches shall be Catalog Numbers 800H-HR2 and 800H-JR2 manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS); Catalog Numbers E34VFBK1 and E34VHBK1 manufactured by Cutler-Hammer (Milwaukee, WS); Catalog Numbers CR104PSG21B and CR104PSG34B manufactured by GE Electrical Distribution & Control (Plainville, Conn.); Catalog Numbers 9001 SKS11B and 9001 SKS4B manufactured by Square D Company (Palatine, IL); or equal.

C. Push Buttons: Normally open or normally closed (as required) momentary contact, non-illuminated with standard legend plate and flush head, black unless color is indicated; contacts as required. Push buttons shall be Catalog Number 800H-AR2 (for black) manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS); Catalog Number E34PB1 (for black) manufactured by Cutler-Hammer (Milwaukee, WS); Catalog Number CR104PBG00B1 (for black) manufactured by GE Electrical Distribution & Control (Plainville, CN); Catalog Number 9001 SKR1B (for black) manufactured by Square D Company (Palatine, IL); or equal.

D. Pilot Lights: Push-to-test type, full voltage T3¼ (9 mm) bayonet base LED cluster bulb, suitable for 120 VAC operation with standard legend plate, lens color as indicated. Pilot lights shall be Catalog Number 800H-QRTH10R (for red) manufactured by Allen-Bradley Company, Incorporated (Milwaukee, WS); Catalog Number CR104PLT82R (for red) manufactured by GE Electrical Distribution & Control (Plainville, CN); Catalog Number 9001 SKT38LRR31 (for red) manufactured by Square D Company (Palatine, IL); or equal.

E. Digital Panel Meters: Programmable 1/8 DIN with 3½ digit seven segment red or green LED readout with front panel rated NEMA 250 Type 4. Provide modular relay, excitation, and analog outputs as required. Digital panel meters shall be Series EDM 35 manufactured by Carlo Gavazzi Incorporated (Buffalo Grove, IL); Hawk II H235 Series manufactured by Simpson Electric Company (Elgin, IL); or equal.

2.8 RELAYS

A. 24 VDC: General purpose, eight-pin relay suitable for 24 VDC coil operation and DIN rail

mounting with retaining clip; snap-in label markers; push-to-test button; and mechanical flag, green LED indicating lamp, and freewheeling diode parallel to the coil. Relays shall be RELECO C2-A20DX/24VDC with S2-B plug-in socket and S3-C retaining clip manufactured by Turck Incorporated (Minneapolis, Minn.); RR Series (Part No. RR-ULC DC24V with SR2P-05C plug-in socket and SR2B-02F1 retaining clip) manufactured by IDEC Corporation (Sunnyvale, CA); or equal.

B. 120 VAC: General purpose, eight-pin relay suitable for 120 VDC coil operation and DIN rail mounting with retaining clip; snap-in label markers; push-to-test button; and mechanical flag and neon indicating lamp parallel to the coil. Relays shall be RELECO C2-A20X/120VAC with S2-B plug-in socket and S3-C retaining clip manufactured by Turck Incorporated (Minneapolis, MN); RR Series (Part No. RR-ULC AC120V with SR2P-05C plug-in socket and SR2B-02F1 retaining clip) manufactured by IDEC Corporation (Sunnyvale, Calif.); or equal.

C. Transient Circuit Protection: Series wired suppression device with a minimum 50 kA surge protection in all modes, suitable for DIN rail mounting, rated for 20 A, 120 VAC, 1φ. Device shall be UL 1449 rated for 400 VAC with an active response time of <1 ns. Unit shall have a set of Form C contacts for alarm conditions. Transient circuit protection shall be Model HS-P-SP-120-30A-RJ manufactured by Innovative Technology, Incorporated (Brooksville, FL); Catalog Number STV25K-10S manufactured by Sola/Hevi-Duty, EGS Electrical Group (Skokie, IL); or equal.

D. Control Power Transformers: Adequately sized with integral primary and secondary fusing. Control power transformers shall be Class 9070, Type TF manufactured by Square D Company (Palatine, IL) or equal.

E. 24 VDC Power Supplies: Switching type with LED status indicators and Form C contacts for alarm conditions. Power supplies shall be SDN Series manufactured by Sola/Hevi-Duty, EGS Electrical Group (Skokie, IL) or equal.

2.9 IDENTIFICATION

A. General: Unless noted otherwise, engraved plastic nameplates shall be white with black letters. Secure nameplates with permanent adhesive.

B. Provide engraved plastic nameplate with 1/2-inch letters to identify each enclosure using identification indicated on the Contract Drawings.

C. Provide laminated plastic nameplate with 1/4-inch letters for each panel-mounted instrument, control device, indicator light according to the function of the controlled item.

D. Each instrument, terminal strip, and relay shall be identified with similar nameplates showing the device number only.

E. Numerically code terminal strips using integral tag holders.

2.10 FABRICATION

A. General Requirements:
   1. Panels shall be assembled by a qualified UL Rated panel builder.

2. Equipment Location: Locate devices, hardware, power supplies, instrumentation, controls, electrical equipment, and wiring so that there is ample room for servicing each item. Each component in and on enclosures shall be able to be removed without affecting other components and without moving other components.
3. Support and restrain panel-mounted components to prevent movement.
4. Expansion Capability: Provide useful mounting space and power supply capacity as additional for future expansion for a minimum of one item per item type installed or 20% of quantity of each type item installed, whichever yields the greater additional space.
5. Terminate control enclosure wiring to field instrument devices, other panels, and future connection to control and monitoring systems at labeled/numbered terminal blocks.
6. Provide physical separation and electrical isolation between noise inducing electrical units, such as SCR drives and switching power supplies, and vulnerable panel components.
7. Provide a minimum of one 120 VAC, 20 A din rail mountable duplex grounding-type convenience outlet in each enclosure. This outlet shall be protected from transients but shall not be included on the UPS circuit (if UPS is required).

B. Wiring:
1. Install wiring runs along horizontal or vertical routes. Angled runs are not acceptable.
2. Group or bundle parallel runs of wire using plastic troughs with replaceable snap-off covers. Label each wire trough.
3. Adequately support and restrain wiring to prevent sagging and movement. Allow adequate length and flex to allow panel door to swing to full open position without stressing or abrading conductors. Securely anchor wiring or bundles on each side of the hinge.
4. Bring all external connections to terminal blocks.
5. Separate AC wiring from DC wiring a minimum of 4-inches (100 mm) using plastic wiring duct.
6. Separate and shield DC signal wiring from control wiring.
7. Use cable ties to bundle like wiring. Secure cable ties to bolted or screwed mounting plates. Use of adhesive mounting plates is not acceptable, except on exterior walls where penetrations are not desirable.
8. Provide grounding lug for electrical grounding of metal panels. Size lugs for system requirements, but in no case less than #8 AWG.
9. Provide isolated grounding for DC signal shields. Configure and terminate to master terminal for connection to an external grounding pad. Grounding for digital hardware and electronic analog components shall be performed in accordance with the manufacturer's recommendations.

C. PLC I/O: For control panels with PLCs, in addition to I/O points required for the control panel to meet functionality requirements of this specification and the respective equipment specifications, the following discrete and analog I/O points shall also be wired and appropriately programmed:
1. For control panels with DC power supplies: Power supply operating status if required.
2. For control panels with UPSs: Control relay to indicate loss of normal power for UPSs
3. Clarification: Vendors are to supply a Contrologix PLC per Specification 461030 in their master control panel for interface with the Plant SCADA system. Vendors that have local control panels can use a CompactLogix PLC (Catalog No. 1769-L33ER) in lieu of the Contrologix PLC if they are using a PLC for the local control panel. Use of a PLC is not required in a local control panel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Control panels internal configuration and layout shall match the design plans. Control panel submittals that deviate from the design plan are not acceptable.

B. Wire all I/O module points to terminal blocks, including additionals.

C. Label terminals with permanent, legible identification, clearly visible with protective cover removed. Terminal blocks and conductors shall be colored as follows:

Type	Terminal Block and Conductor Color
AC (line)	Black
AC (switched)	Red
AC (neutral)	White
AC (source outside panel)	Yellow
DC (+)	Blue
DC (-)	Gray
Ground	Green

3.2 MOUNTING

A. Unless precluded by field obstructions, mount enclosures so that the top of the enclosure is between 60 and 72 inches above the operating floor. Enclosures taller than 72 inches shall be floor-mounted.

B. For wall-mounted control panel enclosures, use stainless steel hardware with wall anchors attached to concrete or masonry walls.

C. For floor-mounted control panel enclosures, provide concrete housekeeping pad a minimum of 3 inches high and 2 inches larger in width and depth than the enclosure with stainless steel floor anchors. Use floor stands where necessary to maintain proper working height.

D. For other locations, install stainless steel metal framing with stainless steel hardware anchored to the handrail or concrete floor or set in concrete anchors.

3.3 CONNECTIONS

A. Drawings indicate the general arrangement of instrumentation and cabling.

B. Electrical: Conform to applicable requirements in Division 40 Sections.

C. Grounding: Ground equipment. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 CONTROL PANEL SCHEDULE

A. General:
1. Minimum control panel enclosure sizes are called out in inches as height by width by depth (H×W×D).

2. Pilot light and beacon colors are abbreviated as follows:
   a. Red – R.
   b. Green – G.
   c. Amber – A.
   d. White – W.
   e. Blue – B.
3. Capitalized letters for panel-mounted pilot devices indicates nameplate lettering.
4. Input/output (I/O) points listed are hard wired to the PLCs located in their respective control panels. SCADA discrete I/O is 24 VDC or 120 VAC. SCADA analog I/O is 4-20 mA.
5. The Control Panel shall be mounted per design plan sheets.
6. The PLC shall be an Allen Bradley ControlLogix 1756-L71 Processor with Ethernet (with readable registers for PLC monitoring). See Section 461030 Programmable Logic Controllers.
7. Panel-Mounted Accessories
   a. Industrial Ethernet Switch (s) (minimum of 8 ports)
   b. Uninterruptible Power System (UPS)
   c. Ethernet Based Radio (where applicable per the plans)
8. Panel Mounted Devices
   a. None
9. Panel Mounted Pilot Devices
   a. None
10. See respective CI drawings and specifications for all details and specifics.

END OF SECTION 46 10 40

DIVISION 46 - WATER AND WASTEWATER EQUIPMENT
SECTION 46 11 00 - PROCESS PIPING, VALVES, FITTINGS AND ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Special Provisions, and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes process piping, fittings, valves, supports and accessories necessary for installation of piping and connection to equipment and structures as shown on the Plans.

1. Section 01 10 10 – Summary of Work Sequence
2. Section 01 14 00 – General Coordination
3. Section 01 33 00 – Submittals
4. Section 09 96 00 – High Performance Coatings
5. Section 46 10 00 – General Requirements
6. Section 46 11 05 – Electric Actuators
7. Division 46 – Process Equipment
8. Division 26 - Electrical

1.3 SUBMITTALS

A. Manufacturers' literature and shop drawings demonstrating compliance with this Specification.

B. Submittals required by this section shall be made in one (1) group for review by the Engineer.

C. Contractor shall provide a piping layout shop drawing and schedule of materials for all proposed piping, fitting, valves and supports 8-in. diameter and larger between process units and between process units and equipment. All piping installation shall be provided with flexibility to allow removal and re-installation of select piping and fittings.

D. Provide a tabulated schedule identifying valve or pipe size, type, location, Plan Sheet and accessories. A submittal with a general list of materials that does not identify specific locations of the equipment will be rejected.

E. The manufacturer shall verify with the submittal the correct valve actuator orientation (manual and electric motor actuators). Verify that the valve and actuator assembly will fit in the space provided in the design locations shown on the drawings with the submittal. Any conflicts shall be brought to the immediate attention of the Engineer.

F. Shop drawings shall include electric actuators per specification Section 46 11 05 for all valves to receive electric actuators, detailing compliance with both specifications for a complete valve and actuator installation (inclusive of necessary startup services specified). The contractor shall verify if electrical actuators can provide the required torque for the operation of valves.

G. Operation and Maintenance Manual: The Manufacturer shall submit two (2) complete copies of an Operation and Maintenance Manual and an electronic copy per Section 01 33 00 – Submittals. The manuals shall be in a 3-ring binder and be sectioned by component with appropriate indexing. Addresses, phone numbers and points of contact for repair and replacement equipment parts and service shall be included.

PART 2 PRODUCTS

2.1 PIPING MANUFACTURERS/MATERIALS (ALL SIZES IPS)

A. Ductile Iron Pipe (D.I.)

1. Clow or equal
2. Latest edition AWWA C-151/C21.51

a. Cement lining, ANSI/AWWA C-104/A21.4; exterior primed per Section 099600.
b. **AIR SERVICE PIPING AND FITTINGS SHALL BE <u>UNLINED</u>**

3. Class 52 or as noted.
4. Primed per Section 09 96 00
5. Joints
   a. Flanged ANSI/AWWA C-115/A21.15 (Above Ground)

      1) American Standard Class 125 Ductile Iron
      2) Gaskets:
         a) Process and water piping: Garlock MULTI-SWELL Style 3760, or equal. 0.125" thickness
         b) All Air Service Piping shall have Garlock Style 9912 BUNA-N or Style 9938 FKM rubber gaskets for high temperature conditions. Gaskets shall be rated for at least 250ºF.
      3) Bolts and nuts best quality fined bar iron, square headed hexagonal nuts ANSI B16.1 Standard, Cadmium plated, SAE Grade 2 or better, except for use in underground valve vaults, meter manholes, process tank interiors, pump wet wells, or other areas subject to corrosion, which shall be stainless steel conforming to the physical properties of ASTM A-193, Grade B-8, Class 2, Type 304.
      4) Lug retained flanges requires written permission of the Engineer for use in specific requested locations.
      5) All piping installation shall be provided with flexibility to allow removal and re-installation of select piping and fittings.

   b. Mechanical ANSI/AWWA C-111/A21.11 (Below Ground)

6. Fittings
   a. Latest edition ANSI/AWWA C-110
   b. Same as pipe
   c. Primed per Section 09 96 00

d. Rated for 250 psi working pressure.

7. Wall pipe/sleeves
   a. Joints per Plans. Buried exterior MJ-Joints shall be restrained-joint.
   b. Intermediate collar or water seal
   c. Primed per Section 09 96 00

B. Plastic Pipe (PVC) (Non-Pressure Applications)

1. Schedule 80, Type I, Grade I per ASTM D-1784, D-1785 and NSF Standard 14
2. Solvent cement ASTM D-2564
3. Fittings
   a. Same material as pipe
   b. Schedule 80: ASTM D-2467 solvent weld joints
   c. Flanged joints: Class 150 ANSI B16.5, flat-faced, socket-end type. Solid gaskets SBR, Garlock, or equal; 1/16 in. thick and full faced. Bolts and nuts shall be stainless steel.
4. Design Stress Rating 200 psi at 73° F
5. Stamped with NSF seal of approval and schedule number.

C. Carbon Steel (Interior air or gas) and Stainless-Steel Pipe (Exterior Air Service)

1. Seamless Carbon Steel Pipe, ASTM A-106, Grade B; Seamless Stainless Steel Pipe ASTM A-312
2. Wall Thickness: 2-in. and smaller Schedule 80 or Schedule 80 stainless per plan; 2-1/2 or larger Schedule 40 or Schedule 40 stainless per plan
3. Joints: Butt-Weld with flat-backing-ring. Welding end detail per Std. MF-270.8.4.
4. Flanged Joints: ASTM A-105 or A-181, Gr. II, 150 lb. Stainless Steel ASTM A-182; Std.; 2-in. and smaller socket or slip-on weld; 2-1/2 and larger weld-neck or slip-on; 1/16-in. raised face with serrated face finish.
5. Bolts: Stud Bolts. ASTM A-193, Gr. B7; ASTM S593 Gr. 2 316 stainless steel.
6. Nuts: ASTM A-194, Gr. 2H; ASTM S594, Gr. 2, 316 stainless steel
7. Gaskets: Garlock Style 9912 BUNA-N or Style 9938 FKM rubber gaskets for high temperature conditions. Gaskets shall be rated for at least 250ºF.
8. Fittings: 2-in. and smaller socket weld, 3,000-lb. Std., ASTM A-105 or A-181 Gr. II; 1-1/2 in. and larger, butt-weld, ASTM A-234, Gr. WPB; Stainless Steel ASTM A-403.
9. Flanged Fittings: Carbon steel ASTM A-105 or A-181 Gr. II, 150 lb. Std. ANSI B16.5; Stainless Steel ASTM A-182.

D. Copper Tubing
1. ASTM B75/B88 Type K, L
2. Drawn Temper, ASTM B88
3. Joints: Solder (95-5 tin-antimony)
4. Flanges: 150-lb. ANSI B 16.24, ASTM B61/B62
5. Bolting: Carbon Steel, ASTM A-307
6. Wrought Copper Fittings (ASTM B16.22)

E. Black Steel Pipe and Fittings (Gas inside building)
1. ASTM A53, Schedule 40 Black Steel Pipe

2. Fittings 2-in. and smaller ASME B16.3, Class 150 Malleable screwed with thread ends ASME B1.20.1
3. Fittings 2-1/2 in. and larger butt weld fittings ASME B16.9 or ASME B16.11
4. Unions 2 in. and smaller 150 lb. screwed and flanged ASME B16.39 Class 150; 2-1/2 in. or larger weld-neck forged steel bolted flanges ASME B16.5, ASTM A-181, Grade 1, 150 lb.
5. Joint compound and type suitable for natural gas.
6. Furnish pipe and fittings with factory-applied, corrosion-resistant polyethylene coating for all below-grade (buried) piping.

F. Polyethylene Pipe
1. PE 3408 high-density, extra high-molecular weight polyethylene
2. ASTM D-3350, cell classification PE 345434C
3. Minimum SDR rating 11 (SDR-11) with minimum pressure rating of 160 psi at 23°C
4. Fittings: molded polyethylene; same pressure rating as pipe
5. Joints: Heat fusion according to manufacturer's instructions
6. Manufacturer: Phillips Drisco Pipe, Chevron Plexco, or equal

2.2 VALVES AND ACCESSORIES

A. Butterfly Valve
1. DeZurik General Service Resilient Seated Butterfly Valve, or equal.
2. Valves shall meet the following minimum requirements:
   a. Conform to AWWA C-504, ANSI Class 125/150 flange drilling.
   b. Cast iron body, flanged end connections.
   c. EPDM seat seal
   d. Stainless seal shaft
   e. Ductile iron epoxy coated disc.
   f. Manual Valves with geared handwheel actuator unless otherwise indicated. Interior located manual valves 7 ft 0 in. above FFE with chainwheel geared actuator. Manual air control valves shall be Lever (locking) actuated.
   g. Provide geared actuator for electric motor actuator where indicated on the plans.
   h. Factory primed per Specification Section 09 96 00.
   i. Electric Actuators shall be provided for valves where called out on the plans. Electric Actuators shall comply with Specification 46 11 05 inclusive of startup services specified therein.

B. PVC Ball Valve
1. Hayward Safe Block True Union Ball Valve or equal
2. PVC, socket end connection
3. True Union to allow easy installation and removal
4. Full Port opening
5. PVC Ball Valve Actuators: Per Plan Locations
   a. Manufacturer: Hayward Flow Control Series EAU1 Electronic Actuators, or equal.
   b. For use with two-way and three-way PVC ball Valves
   c. Voltage: 120V
   d. Full Load Amps: 2A

e. Rated Torque: 120ftlbs
f. Enclosure: NEMA 4X
g. Conduit Size: 1/2" EMT
h. Thermal Protection: Motor Thermal Protection, Mechanical Brake Motor
i. Controls: Wired to the Plant PLC, operator selectable position, and position feedback.

C. PVC Ball Check Valve
1. Flo-Matic Type 208 or equal
2. PVC – Socket end connection
3. Y-Patkin, full port flow with access port and nitrite seal
4. Nitrile (BUNA-N) ball
5. Fitted piping with true-union connections for easy installation and removal

D. Valves in Copper Tubing (Globe and Check)
1. Acceptable manufacturers
a. Nibco
b. Apollo
c. Jenkins
2. Bronze body, screwed type with brass adapters. No solder or brazed ends allowed.
3. Valves drip-light, rated for continuous duty for a minimum of 25 psi and 25° F higher than duty imposed.
4. Class 150 bronze globe, silicon bronze stem, bronze packing gland and nut, bronze body, disc holder, disc, MSS SP-80.
5. Class 150 bronze check, horizontal swing, y-pattern, renewable seat and disc MSS SP-80, all bronze construction.

E. Stainless Steel Ball Valves
1. Apollo 76 series or equal.

F. Gas Valves
1. Gas Cock, equipment shut-off, 2 in. and smaller.
a. ASME B16.33, IAS listed bronze body, stainless steel discs
b. Dupont Viton fluoroelastomer O-ring seal
c. 175 psi; -30 to 350°F
d. Quarter turn open/close
e. ASA certified for gas
f. Crane, Red-White, Watts, Nibco or equal

2. Gas Cock, Main or Equipment Shut Off 2-1/2 in. or larger

a. Lubricated plug valve with lever handle
b. UL 842 listed
c. AGA certified for gas

G. Water Hammer Arrestors, Precision Plumbing Products, Portland, OR.
1. Model SC-1000
Operating Pressure 0-200 psi
Max Spike Pressure 400 psi

Connection	threaded brass
Cap	free turning brass
Piston	free turning brass
O-Ring	EPDM
Seal Lubricant	Dow silicone compound #111
Factory Charged40	
Nitrogen pressure (psi)	

2. Water hammer arrestors shall be precharged in the factory.
3. Provide a S.S. Ball Valve at each Surge Arrestor for maintenance removal.
4. Provide of four (4) surge arrestors on the NPW (2 ea) and Potable water distribution lines (2 ea) in each site building and new service into an existing building. Water hammer arrestor locations will be field verified and determined.

H. Solenoid Valves
1. Solenoid Actuated Valves shall be ASCO or equal, Red Hat Class 1/Div 2, 120V, 304 stainless steel construction, NPT connection for the sized pipe indicated on the plans. Normally closed operation (power to open).
2. Valve on non-potable water line connections shall meet the pressure classification of the connection pipe or equipment.

I. Air Release Valves
1. Acceptable Manufactures
   a. Val-Matic Valve and Manufacturing Corporations Water Combination Air Valve, or equal
2. AWWA C512 and NSF 61 Certified
3. Size to fit application shown on plans
4. Automatic float operated, designed to exhaust large quantities of air during the filling of a pressure vessel or piping system and close upon liquid entry. The valve shall open during draining or if a negative pressure occurs. The valve shall also release accumulated air from a piping system while the system is in operation and under pressure. The valve shall perform the functions of both air release and air/vacuum valves and furnished as a single body.
5. Full size NPT inlets and outlets equal to the nominal valve size. Provide a through flow area equal to the nominal size.
6. Single body combination valves shall have an expanded outlet to provide full flow area around the guide mechanism. The valve shall have a double guided plug on 2 in. (50mm) and larger sizes, and an adjustable threaded orifice button. The plug shall be protected against direct water impact by an internal baffle. On valve sizes 4 in. (100mm) and smaller, the plug shall have a precision orifice drilled through the center stem.
7. The float, guide shafts, and bushings shall be constructed of Type 316 stainless steel. Resilient seats shall be Buna-N.
8. Body shall be cast iron
9. Location as shown on the plans

2.3 PRESSURE GAUGES

A. Pressure gauges shall be installed on the suction and discharge of all process pumps for the

project (except for sump pumps). Submersible pumps shall have discharge pressure gauges only. Pressure gauges shall be installed adjacent to all pressure transducers.

B. All gauges shall be tapped from the process piping with a brass isolation cock and a diaphragm seal to separate the gauge from the process fluid.

C. Ashcroft 45 - 1209 - S - L - 04 - 100# - XLL or equal
1. Type 100 Ashcroft diaphragm seal
2. 4-1/2 in. dial diameter, brass wetted material, ½ in. NPT, glycerin filled (discharge gauges), silicon filled (compound suction gauges).
3. Diaphragm seal ½ in. NPT, 316 stainless steel diaphragm and housing, glycerin filled (discharge gauges), silicon filled (compound suction gauges).
4. Pressure ranges (unless otherwise indicated on the Plans)
   a. Suction side compound 30 in. Hg/60 psi
   b. Discharge side 0/100 psi

2.4 HORIZONTAL SWING FLAP CHECK VALVES

A. Check Valve: Val-Matic Swing Flex® Check Valve as manufactured by Val-Matic Valve and Manufacturing Corp., Elmhurst, IL.

1. Materials shall conform to the following:
   - Body/Cover — Cast Iron ASTM A126, Class B
   - Disc — BUNA-N, ASTM D2000-BG; Fabric Reinforced
   - Gasket — Lexide NK-511
   - Cover Bolts — Stainless Steel
   - Backflow Bushing — Brass ASTM B16, A360
   - Backflow Rod — Stainless Steel T304, ASTM A276
   - Rod Wiper — Molythane
   - O-Ring Seal — BUNA-N
   - Handle — Stainless Steel
   - Jam Nut — Brass ASTM B16
   - Retaining Ring — Carbon Spring Steel
2. Interior Factory Finish Coated with epoxy system compliant with Specification Section 09 96 00.
3. ANSI Flanged Ends
4. Backflow Actuator Factory Installed.
5. Full Body Flanged, Domed Access Cover
6. The valve body shall have full flow equal to nominal pipe diameter at any point, through the valve. The seating surface shall be on a 45° angle to minimize disc travel. The top access port shall be full size, allowing removal of the disc without removing the valve from the pipeline. The access cover shall be domed in shape to allow the disc to be fully operational in lines containing a high-solids content.
7. The disc shall be of one-piece construction, precision molded with an integral O-ring type sealing surface and contain steel and nylon reinforcements in both the Memory-Flex™ and central disc areas. The flex portion of the disc shall be warranted for 25 years. Non-slam closing characteristic shall be provided through a short 35° disc stroke and a Memory-Flex™ disc return action.

8. Backflow capabilities shall be available by means of screw type backflow actuator. The actuator shall be field installable without modification to the valve, a need for special tools or removal of the valve from line.
9. The valve shall be cycle-tested 1,000,000 times with no signs of wear or distortion to the valve disc or seat and shall remain drop tight at both high and low pressures. The tests' results shall be independently certified.
10. The valve shall be capable of withstanding the working pressure for the pumps specified and surge pressure.

2.5 FLOW INDICATION DEVICES

A. Pressure Switches
   1. Manufacturer: Square D Series 9012GAW-4, or equal
   2. Range of Detection: 1.5 to 75psi, adjustable differential
   3. Maximum Operating Pressure: 240psi
   4. Cable Entry: 0.5-inch NPT
   5. Process Connection: 1/4-inch, Contractor to provide additional fittings as required for functional installation.
   6. Voltage: 120V
   7. Full Load Amps: 3A
   8. Locations: Per process and electrical drawings
   9. Wiring: Per electrical drawings, capable of providing feedback to both pump VFDs and local PLC as required.

B. Flow Switches
   1. Manufacturer: Turck Model FCS-N1/2A4P-AP8X-H1141
   2. Operating Range: 0.1 to 5 ft/s
   3. Process Connection: 1/2-inch, Contractor to provide additional fittings as required for functional installation.
   4. Operating Voltage: 19 to 28.8 VDC
   5. Full Load Amps: 0.4A
   6. Housing: Stainless Steel, Protection Class: IP67
   7. Locations: Per process and electrical drawings.
   8. Wiring: Per electrical drawings, capable of providing feedback to both pump VFDs and local PLC as required.

2.6 PIPE SUPPORTS

A. Pipe supports will be required and located so the weight of interconnecting pipe will not be supported by equipment and so that all piping is adequately braced and supported as required to prevent movement.
   1. Concrete type – as shown on plans
   2. Piping Pipe Supports

      a. Floor supports
         1) Grinnel Fig. 264, B-Line or equal with floor plate or equal. Cast iron vertical Section DI 3 in. minimum diameter for 4 ft or less stand height. DI 4 in. minimum diameter for 4-ft or higher stand height.
         2) 2 in. and Smaller Pipe Supports: Grinnel Fig. 192 with floor plate or

equal. Cast iron vertical Section DI 1 in. minimum diameter.

3) Provide shielding and/or neoprene liner to isolate dissimilar metals.

b. Hangers

1) Grinnel Fig. 260, B-Line or equal adjustable clevis type. Stainless steel hanger and rod where noted on the plans.
2) Maximum load shall be 1,000 lbs. per hanger.
3) Anchorage to ceiling suitable for concrete or hollow core pre-cast concrete panel per plan.
4) Hangar anchorage and rod diameter per pipe weight, suitable for full-pipe and appurtenance loads. New concrete insert Fig. 283. Existing concrete single lug plate Fig. 47 with S.S. Hilti Epoxy Drilled Anchors.
5) Provide shielding and/or neoprene liner to isolate dissimilar metals.
6) Support hanging pipe segments with cross-braces to adjoining walls or ceiling as required to prevent movement.

B. Copper Tubing Supports

1. Plastic coated adjustable "J" hangers, B-Line Model #B3690-C or equal, for wall or ceiling mounting.
2. Maximum spacing between supports for 1 in. and smaller copper tubing shall be 7 ft.

C. Plastic Piping Pipe Supports

1. All plastic piping shall be supported by a non-metallic channel framing strut and/or strapping system by Aickinsrut, B-line, or equal. Provide lateral bracing support on all hanging pipe as required to prevent movement.
2. Universal pipe clamps shall be non-metallic and non-conductive. They shall be made by the injection modeling process using polyurethane base resin suitably compounded for corrosion service.
3. All channel framing connections shall be made with stainless steel nuts and bolts.
4. All installation cuts and/or exposed ends of fiberglass struts shall be sealed with an epoxy sealant, such as Dercon five-minute epoxy. Lateral bracing shall be provided as required to prevent pipe movement.
5. Provide shop drawing submittal of support system and materials and support location/layout.

D. Flexible Tube Piping

1. B-line or equal.
2. Fiberglass strut system wall, ceiling, or rack supported per the plan pipe routing. Provide lateral cross-bracing as required on hanging pipe segments to prevent pipe movement. Anchor bracing, channels and supports to walls and ceilings required with S.S. Anchors.
3. Provide shop drawings submittal of support system and materials, and support location/layout.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install each item per manufacturer's instructions.

B. Horizontal spacing on supports for D.I. 6 ft maximum. PVC and P.E. at spacing to prevent sag or deflection per the pipe manufacturer's instructions.

C. Vertical support spacing 4 ft maximum.

D. Sleeves and wall pipes positioned and supported in structural concrete form work. Locations per plans.

3.2 PIPING CONSTRUCTION

A. All pipe ends capped during construction period.

B. All exposed ends provided with blind flanges in D.I. piping or capped PVC/P.E.

C. For PVC/P.E. pipe provide off-sets, bends and other fittings provided to fit plan pipe route.

D. The Engineer to approve piping work prior to burying, covering or concealing.

E. All gauges and switches connected to piping shall have isolation valves.

F. All gauges and switches shall be fitted with snubbers for control of water hammer and pressure surging.

3.3 TESTING

A. All building piping to be pressure-tested hydrostatically.

B. Contractor to furnish labor/materials/tools for testing at no extra compensation.

C. Test method to be approved by the Engineer.

D. Pressure maintained continuously for two hours minimum.

E. Test pressures

1. Process piping – 125 psi

F. Metallic (excluding copper, PVC and stainless steel) piping, fittings, supports, stands, valves and accessories to be painted per Section 09 96 00. All piping, fittings and valves shall be shop-primed at the factory per Specification Section 09 96 00.

3.4 Startup Services – Per specification section 46 11 05 for all valves supplied or specified or specified with electrical motor actuators.

3.5 PERFORMANCE GUARANTEE

A. The Equipment Manufacturer shall warrant operation of the equipment and materials for one year following startup and acceptance. Equipment process disruptions or failures during the warranty period shall be corrected by the Manufacturer.

END OF SECTION 46 11 00

DIVISION 46 00 00 - PROCESS EQUIPMENT
SECTION 46 11 05 – ELECTRIC ACTUATORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Special Provisions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes process piping, fittings, valves, supports and accessories necessary for installation of piping and connection to equipment and structures as shown on the Plans.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 01 10 10 – Summary of Work Sequence
2. Section 01 14 00 – General Coordination
3. Section 01 33 00 – Submittals
4. Section 05 50 00 – Metal Fabrication
5. Section 09 90 00 – Process Equipment and Ferrous Metal Painting
6. Section 22 13 13 - Exterior Piping Valves Fittings and Accessories
7. Section 46 10 00 – General Requirements
8. Section 46 11 00 - Process Piping Valves Fittings and Accessories
9. Section 46 11 50 - Sluice, Slide (Stop), Weir, and Flap Gates
10. Division 26 - Electrical

1.3 SUBMITTALS

A. Manufacturers' literature and shop drawings demonstrating compliance with this Specification.

B. Submittals required by this section shall be made in one (1) group for review by the Engineer.

C. Provide a tabulated schedule identifying electric actuator model number, locations, capabilities, and options or accessories provided. A submittal with a general list of materials that does not identify specific locations of the equipment will be rejected.

D. The manufacturer shall verify with the submittal the correct valve actuator orientation. Verify that the actuator assembly will fit the valve, gate, or otherwise in the space provided in the design locations shown on the drawings with the submittal. Any conflicts shall be brought to the immediate attention of the Engineer.

E. Operation and Maintenance Manual: The Manufacturer shall submit two (2) complete copies of an Operation and Maintenance Manual compliant with Specification Section 01 33 00.

F. Operator Calculations: The manufacturer shall submit calculations to determine the operating torque for each valve, gate and weir plate location and submit the appropriate electric actuator and gearbox model combination for each location based on these calculations

G. Factory testing - Every actuator shall be factory tested to verify rated output torque, output speed, handwheel operation, local control, control power supply, valve jammed function, all customer inputs and outputs, motor current, motor thermistor, LCD and LED operation, direction of rotation, microprocessor checks, and position-sensor checks. A report confirming successful completion of testing shall be submitted as a shop drawing prior to delivery.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Bray Electric Actuator
B. Or equal

2.2 ACTUATOR

A. Actuator Model: Series 70 Electric Actuator With **Modulating** Electric Control

B. General

1. The actuator shall be compact and low profile to minimize space requirements.

2. The actuator shall provide adjustable operation up to 90°.

3. The actuator shall provide easy access for field wiring and adjustment.

4. The actuator shall be built to withstand line vibration and shock without failure.

C. Enclosure

1. The actuator shall consist of an electric motor, servo motor, mechanical gear reduction, absolute position encoder with redundancy, electronic torque sensor, solid state motor controller, electronic control, protection, and monitoring package, manual override handwheel, valve interface bushing, and local control switches all contained in an enclosure that is sealed to NEMA 4X, IP65 & IP67 ratings, or as specifically noted on the plans. Actuator design life shall be at least one million drive sleeve turns.

2. The enclosure shall be die-cast aluminum.

3. The enclosure shall be polyester or Seacorr coated (as specified) for environmental protection.

4. The enclosure shall be provided with captive cover bolts to prevent loss of cover bolts when cover is removed.

5. The enclosure shall have two conduit connections (one for power wiring and one for control signal wiring) in either NPT or metric threads as specified.

6. The actuator enclosure shall be provided with a high visibility valve position display prominently labeled and color coded to indicate the valve position throughout the full range of travel.

D. Motor

1. The power transmission shall be completely bearing-supported and consist of a hardened alloy steel worm and alloy worm gear, and spur gear reduction, all immersed in an oil-bath lubricated using a synthetic oil designed specifically for extreme pressure worm and worm gear transmission service.

2. The motor shall be a single phase, permanent split capacitor induction type with Class F or better insulation.

3. The motor shall contain a built-in UL approved automatic reset thermal overload protector set at 275ºF (135ºC) embedded in the motor windings.

4. Motors shall be 120 $V_{AC,}$ or 220 V_{AC} (230 VAC compatible) 50/60 Hz as specified.

E. Actuator Gear Train System

1. Valve position shall be sensed by an absolute position encoder, employing system-on-chip technology using a contactless magnet to provide redundant, 12-bit resolution over 360 degrees. Each of the position sensing circuits shall be redundant, permitting up to 50% fault tolerance before the position is incorrectly reported. The built in self-test (BIST) feature shall discern which failures signal a warning only and which require a warning plus safe shutdown of the actuator. Open and closed positions shall be stored in permanent, nonvolatile memory. The encoder shall measure valve position at all times, including both motor and handwheel operation, with or without power present, and without the use of a battery. The absolute encoder will be capable of resolving down to 0.1% of output shaft position over 360 degrees.

2. The actuator shall have a self-locking gear train system consisting of a worm and worm gear output drive mechanism, which will hold the valve in the desired position without the need for an electro-mechanical braking system.

3. The spur gear train shall have precision cut multi- staged gears which will withstand locked rotor conditions and are permanently lubricated at the factory.

4. The actuator shall have an Oldham coupler to correct any misalignment between the output gear and the cam shaft.

5. An electronic torque sensor shall be included. The torque limit may be adjusted from 40 to 100% of rating in 1% increments. The motor shall be de-energized if the torque limit is exceeded. A boost function shall be included to prevent torque trip during initial valve unseating and during extreme arctic temperature operation (down to -

60°C), and a "Jammed Valve" protection feature, with automatic retry sequence, shall be incorporated to de-energize the motor if no movement occurs.

F. Mechanical Travel Stops

1. Mechanical stainless-steel travel stops shall be provided and located outside the actuator enclosure for ease of adjustment.

2. Stainless steel lock nuts shall be provided to hold the travel stops in position.

3. O-ring seals for waterproof protection shall be provided.

4. The mechanical travel stops shall limit the travel of the actuator in either direction to the full travel range of the valve.

5. Stainless steel spacers shall be provided to prevent adjustment of travel stops above 0° and below 90°.

G. Manual Override

1. The actuator shall be equipped with a manual override handwheel to rotate the valve without electrical power.

2. The manual override system shall ensure efficient manual operation without the use of extra tools or levers.

3. A motor power cutout switch shall be provided to cut power to the motor when the actuator manual override is engaged.

H. Travel Limit Switches

1. Travel limit switches shall limit the actuator travel in both the open and closed direction to travel.

2. Travel limit switches shall be held in brackets for accurate and repeatable valve position feedback.

3. Travel limit switch cams shall be infinitely adjustable by finger touch or screwdriver.

4. All travel limit switches shall be:

    a. Single Pole Double Throw (SPDT) Form C, UL Listed, and CSA Approved
    b. 10A at 125/250 V_{AC} and 1/2A at 125 V_{DC}.

5. Travel limit switches shall be pre-wired to a terminal block for ease of access and all internal wiring shall range from 12-22 AWG.

I. Service Requirements

1. Actuator shall be designed for electrical operation under the following service conditions:
    a. Temperature Range: -20°F to 150°F (-29°C to 65°C)
    b. Duty Cycle:
        i. 25% for Intermittent Operation
        ii. 100% for Continuous Operation

J. Testing

1. All actuators shall be factory tested at rated load to ensure proper operation.

K. Mounting

1. All actuators shall comply with ISO 5211 and mount directly to the valve mounting flange and stem without the need for any brackets or couplings.

2. The control module shall include logic circuit boards mounted to a steel plate and attached in the control compartment with captive screws. The module shall be easily removed through the use of plug-in connectors. All internal wiring shall be flame-resistant, rated 105°C, and UL/CSA listed. Voltage shall be software detectable and configurable

L. Torque Limiting System

1. Limits torque output during electrical operation.

2. Actuator shall include two SPDT mechanical switches and two factory-calibrated adjusting screws.

3. The switches, in response to a predetermined load on the actuator output shaft, shall interrupt power to the motor.

4. The switches shall operate at any point and in both directions of actuator travel.

5. The motor controller shall perform as the motor reverser and shall be solid state with no moving mechanical parts. The control module shall also include an auto reversal delay to inhibit high current surges caused by rapid motor reversals.

M. Heater

1. The sensor shall have an integrated heater that prevents build-up of internal condensation.

2. The heater shall have a self-regulating temperature control.

3. The heater shall be pre-wired to the terminal block for ease of connection to external sources.

4. Rated output shall be 5W at 120 V_{AC} or 220 V_{AC}.

N. Local Control Station

1. Permit local electrical operation of the actuator.

2. Flush mount to the actuator and include:

   a. A local-off-remote control switch.
   b. An open-stop-close switch
   c. Two lights which indicate open and closed valve position.
   d. Two ¾" NPT conduit entries in base of enclosure for customer wiring.

3. Enclosure shall be aluminum and weatherproof.

O. Battery back-up

1. User-selectable valve fail position upon loss of power supply in 24V applications.

2. Shall flush mount to the actuator and include:

   a. Visual and remote indication of battery status and operation.
   b. Field selectable valve fail position.
   c. Two ¾" NPT conduit entries in base of enclosure for customer wiring.

3. Enclosure shall be aluminum and weatherproof.

P. Potentiometer

1. Actuator shall provide continuous feedback of valve position.

2. The potentiometer shall be 10k Ohm gear driven.

Q. Auxiliary Switches

1. Indicates travel position for remote customer control systems.

2. All auxiliary switches shall be:

   a. Single Pole Double Throw (SPDT) Form C, UL Listed and CSA approved.
   b. 10A at 125/250 V_{AC} and 1/2A at 125 VDC.

3. Up to 6 auxiliary switches may be added.

4. A phase correction circuit shall be included to correct motor rotation faults caused by incorrect site wiring. The phase correction circuit shall also detect the loss of a phase. The monitor relay shall trip, and a warning message shall be displayed on the LCD screen to alert the User that, although the QX remains fully functional, higher current will be drawn from the remaining two power lines as long as the phase fault persists. A persistent fault shall signal an alarm to the PLC.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install each item per manufacturer's instructions.

3.2 TESTING

A. Provide field testing of each electric actuator

3.3 STARTUP SERVICE/CERTIFICATION (Electric Valve Actuators)

A. Manufacturer shall provide equipment field service engineering support for a period of three days (8 hrs. on site per day).

B. The Manufacturer's field service engineer shall assist in system balancing, startup testing, installation questions, provide initial startup clarification, initial system operating adjustments and complete system check out. Provide instruction of operating personnel in all necessary operating and maintenance procedures including a step-by-step review of the Operations and Maintenance Manual.

C. The Manufacturer shall provide written reports covering the technician's findings and installation certification/approval shall be submitted to the Owner covering the inspection and outlining in detail any deficiencies noted and proposed corrective action of corrective procedures.

3.4 PERFORMANCE GUARANTEE

A. The Equipment Manufacturer shall warrant operation of the equipment and materials for one year following startup and acceptance. Equipment process disruptions or failures during the warranty period shall be corrected by the Manufacturer.

END OF SECTION

DIVISION 46 00 00 - PROCESS EQUIPMENT
SECTION 46 11 65 – MAGNETIC FLOW METER

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General Conditions, Special Provisions and Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

A. This section includes furnishing in-line magnetic flow meters (sensors and converters) in the locations shown on the Plan Drawings and specified herein to monitor the liquid flow and volume for a complete and satisfactory operating installation.

B. Related Sections:

1. Section 01 10 10 – Summary of Work Sequence
2. Section 01 14 00 – General Coordination
3. Section 01 33 00 – Submittals
4. Section 46 10 00 – General Requirements
5. Section 46 11 00 – Process Piping, Valves, Fittings and Accessories
6. Division 26 - Electrical

1.3 SUBMITTALS

A. Product Data: The equipment manufacturer shall provide literature, specifications and data for all components and accessories.

B. Manufacturer Certification: At the time of equipment shop drawing submittal, the manufacturer shall provide a certificate stating the following:

1. The equipment meets the detailed requirements and intent of the Specifications or stating in itemized detail the variance between that specified and that being offered.
2. The equipment can be installed and will operate satisfactorily in the location as shown on the Plans or stating the changes that must be made so that it can be installed.
3. A guarantee to make any necessary revisions or replace the equipment if it is determined after initial start-up that the equipment or ancillary components will not meet the detailed requirements and intent of the specifications.

C. Shop Drawings: The manufacturer shall submit shop drawings delineating the dimensions, equipment components, wiring diagrams and all essential details.

D. Manufacturer shall provide installation instructions and required installation and assembly drawings to the contractor detailing all installation requirements for a complete on-line operating installation of the specified equipment, and ancillary appurtenances.

E. Operation and Maintenance Manual: The Manufacturer shall submit two (2) complete copies of an Operation and Maintenance Manual compliant with Specification Section 01 33 00.

F. Factory Testing: The Manufacturer shall test the equipment to ensure proper operation and completeness of all interrelated components prior to delivery. The Manufacturer shall provide the Owner complete written results of the factory testing, certifying that the equipment operates according to specified conditions.

1.4 WARRANTY

A. The equipment shall be guaranteed against defects in material and workmanship under normal use and service for a period of one year after start-up and acceptance during which time repairs or replacements shall be made without charge.

PART 2 PRODUCTS

2.1 GENERAL DESCRIPTION

A. Furnish a pulsed DC electromagnetic flow meter suitable for fixed-site measurement of uni-directional flow in a tube pipe.

B. The flow meter shall consist of a flow tube and a converter and transmitter which shall indicate, totalize and transmit flow rate to the State Street PLC and tied to the RPWC SCADA system and provide local readout on a wall-mount NEMA 4X panel. The flow tube shall use a spool piece configuration with field interchangeable sensors containing coils and electrodes.

2.2 ACCEPTABLE MANUFACTURERS

A. Proline Promag W400 in-line electromagnetic flowmeter manufactured by Endress+Hauser, c/o George E. Booth Co., (815) 721-3053.

B. Or equal

2.3 DESIGN CRITERIA

A. Plant Influent Line
1. Raw Water
Pipe Diameter = 8-inch
Min Flow = 155 GPM
Max Flow = 4850 GPM

B. Low Service Pump Station
1. Filtered Water:
Pipe Diameter = 8-in
Min Flow = 155 GPM
Max Flow = 4850 GPM

C. Backwash Pump Line:
1. Backwash Water
Pipe Diameter = 16-inch

Min Flow = 600 GPM
Max Flow = 4800 GPM

D. Finished Water Line (To Trimble):
1. Finished Water
Pipe Diameter = 8-inch
Min Flow = 155 GPM
Max Flow = 4850 GPM

E. Finished Water Line (To Palestine):
1. Finished Water
Pipe Diameter = 16-inch
Min Flow = 600 GPM
Max Flow = 4850 GPM

2.4 EQUIPMENT MATERIALS/CONSTRUCTION

A. Magnetic Flow tube: (6-in. or smaller)

1. Model:
   a. 12-inch or smaller: A0022673
   b. 14-inch or larger: A0017041
2. Flow tube end connections and construction: Wafer body, mount between ANSI Class 150 flanges with flange bolting kit.
3. Measuring Tube:
   a. 12-inch or smaller: Stainless Steel, 1.4301/1.4306/304/304L
   b. 14-inch or larger: Stainless Steel, 1.4301/304
4. Enclosure finish: Per Specification Section 09 90 00; Factory Finished
5. Lining material: Hard Rubber, Polyurethane
6. Electrode material: Stainless Steel, 1.4435 (316L); Alloy C22, 2.4602 (UNS N06022); tantalum
7. Process temperature range:
   a. For Hard Rubber: 32°F to 176°F (0°C to 80°C)
   b. For Polyurethane: -4°F to 122°F (-20°C to 50°C)
8. Minimum conductivity at process fluid: 5 µS/cm
9. Flow rate minimum and maximum upper range values:

   For 8-in. - 155 and 4850 gpm
   For 16-in. - 600 and 19,000 gpm

10. Maximum Signal cable length: 100 ft.

B. Transmitters:

1. Model: Promag 400
2. Device versions and materials
   a. Compact version: compact housing
      i. Polycarbonate plastic
      ii. Aluminum, AlSi10Mg, coated
   b. Remote version: wall-mount housing
      i. Polycarbonate plastic

ii. Aluminum, AlSi10Mg, coated

3. Configuration:
   a. External operation via four-line, illuminated local display with touch control and guided menus ("Make-it-run" wizards) for applications:
      i. Via operating tools (e.g. FieldCare)
      ii. Via Web browser (e.g. Microsoft Internet Explorer)
   b. Also, for device version with EtherNet/IP output:
      i. Via Add-on Profile Level 3 for automation system from Rockwell Automation
      ii. Via Electronic Data Sheet (EDS)
   c. Also, for device version with PROFIBUS DP output:
      i. Via PDM driver for Siemens automation system

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with Manufacturer's installation instructions and recommendations.
B. Paint system per Specification Section 09 90 00.

3.2 EXAMINATION

A. Verify site conditions.

3.3 STARTUP SERVICE/CERTIFICATION

A. Manufacturer shall provide equipment field service engineer for a period of two days (8 hrs. on site) each.

B. The Manufacturer's field service engineer shall provide initial startup certification, initialization and set-up of system operating parameters and complete system checkout, assist in questions during installation and shall fully calibrate the sensor and transmitter for operating conditions. Provide instruction of operating personnel in all necessary operating and maintenance procedures including a step-by-step review of the Operations and Maintenance Manual.

C. The Manufacturer shall provide written reports covering the technician's findings, and installation certification/approval shall be submitted to the Owner covering the inspection and outlining in detail any deficiencies noted and proposed corrective action of corrective procedures.

3.4 PERFORMANCE GUARANTEE

A. The equipment manufacturer shall warrant operation of the equipment and materials for one year following startup. Equipment process disruptions or failures during the warranty period shall be corrected by the Manufacturer.

END OF SECTION 46 11 65

DIVISION 46 00 00 - PROCESS EQUIPMENT
SECTION 46 11 76 – ULTRASONIC LEVEL SENSORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General Conditions, Special Provisions and Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

A. This section includes furnishing and installation of an ultrasonic level sensors for level control and/or flow measurement in various locations as shown on the Plans and specified herein and in the Division 26 Specifications related to controls and SCADA. Provide for interface and connection to the City's SCADA system and assigned PLC for a complete and functioning installation.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 01 10 10 – Summary of Work Sequence
2. Section 01 14 00 – General Coordination
3. Section 01 33 00 – Submittals
4. Section 46 10 00 – General Requirements
5. Division 26 - Electrical

1.3 SUBMITTALS

A. Product Data: The equipment manufacturer shall provide shop drawings, details and specifications showing dimensions and details of the equipment and ancillary components specified herein.

B. Manufacturer Certification: At the time of equipment shop drawing submittal, the manufacturer shall provide a certificate stating the following:

1. The equipment meets the detailed requirements and intent of the Specifications or stating in itemized detail the variance between that specified and that being offered.
2. The equipment can be installed and will operate satisfactorily in the location as shown on the plans or stating the changes that must be made so that it can be installed.
3. A guarantee to make any necessary revisions or replace the equipment if it is determined after initial start-up that the equipment or ancillary components will not meet the detailed requirements and intent of the specifications.

C. Shop Drawings: The manufacturer shall submit shop drawings delineating the dimensions, equipment components, wiring diagrams and all essential details. Provide list of materials and components, with quantities and features keyed to the appropriate design configuration, application and location shown on the Plans. Provide installation detail (section) showing clearances, dimensions and supports for each specific application indicated on the Plans.

D. Manufacturer shall provide installation instructions and required installation and assembly

drawings to the contractor detailing all installation requirements for a complete on-line operating installation of the specified equipment and ancillary appurtenances.

E. Operation and Maintenance Manual: The Manufacturer shall submit two (2) complete copies of an Operation and Maintenance Manual compliant with Specification Section 01 33 00.

E. Factory Testing: The Manufacturer shall test the equipment to ensure proper operation and completeness of all interrelated components prior to delivery. The Manufacturer shall provide the Owner complete written results of the factory testing, certifying that the equipment operates according to specified conditions.

G. Electrical Wiring Diagrams

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Ultrasonic Level Sensors

1. Endres Hauser Prosonic S FDU90 Level Transducer with Prosonic FMU90 Transmitter, c/o George E. Booth Co., (815) 721-3053
2. or equal

2.2 EQUIPMENT DESCRIPTION

A. Ultrasonic level transducers shall meet the following minimum requirements:

1. Maximum Measuring Range: 9.8 ft (in liquids) as required for design application)
2. PVDF housing and facing. Fully encapsulated and hermetically welded.
3. Beam Angle = 12° (typical)
4. Stainless steel support bracket, where shown on the Plans. The bracket shall be sized and configured for installation in the location shown on the Plans with sufficient spacing from the adjacent wall and equipment to avoid interference for the applicable channel, tank or basin depth.
5. Process temperature: -40°C to 80°C (-40°F to 176°F)
6. Process pressure: 0.7 bar to 4 bar (10.15 psi to 58 psi)
7. Integrated Temperature sensor.

B. The Level Monitoring System and Transmitter shall meet the following minimum requirements.

1. Operations

Modes of Operation	Level, differential level, total pumped volume and open channel flow.
Range	From 0.3 m (1 ft) to 3 m (9.8 ft)
Accuracy	±2mm + 0.17% of measured distance

Number of Points	One point for level measurement, pump control and open channel measurement; two points for differential level
Blocking distance	0.07 m (0.23 ft)
Resolution	Distance Measurement: 1 m

2. Display

Panel	High contrast Illuminated 6-Line Display,
Measuring Error	±0.2% maximum span of the sensor
Volume-	Volume measurement and Display
Specialties	Protection Class IP 66 / NEMA 4X. Automatic sensor recognition.

3. Inputs/Outputs

Voltage	Transmitter voltage: 90 V_{ac} to 253 V_{ac} (50/60 Hz). 23 VA Max. 100 mA maximum power consumption at 230 V_{ac}. Sensor powered through transmitter.
Alarms	Programmable for level, rate of change of level, differential level, level in bounds or out of bounds, loss of echo and temperature.
Analog Output	4 to 20 mA with HART. 0 to 20 mA without HART.
Output damping	Freely selectable, 0 to 1000 s
Load	Max 600 Ω, influence negligible
Max. Ripple	U_{SS} = 200 mV at 47 to 125 Hz (Measured at 500Ω)
Max. Noise	U_{eff} = 2,2 mV at 500 Hz to 10 KHz (Measured at 500Ω)

4. Installation

Enclosure	Wall-Mounted Enclosure-Polycarbonate CSA type 4/NEMA 4X, IP65 rated enclosure. Size: 150 x 215 x 180 mm (5.91-in. x 8.46-in. x 7.09-in.)

Operating Temperature- -40° to 60°C (-40° to 140°F) for the electronics.

Process Temperature	-40° to 80°C (-40° to 176°F).
Cable Extensions	Up to 300m (984ft) max. with LiYY 2 x (0.75) D + 2 x 0.75 type cable.
Process Temperature Compensation	Built-in temperature sensor.
Certificates/Approvals	ATEX, FM, CSA, IEC Ex, INMETRO, NEPSI, EAC Ex

PART 3 EXECUTION

3.1 INSTALLATION

A. Install according to Manufacturer's instructions and Plan Drawings.

3.2 STARTUP SERVICE/CERTIFICATION

A. Manufacturer provide equipment field service engineer for a period of one day (8 hrs. on site).

B. The Manufacturer’s field service engineer shall provide assistance with questions during equipment installation, initial startup certification, initial system operating adjustments and complete system check out. Provide instruction of operating personnel in all necessary operating and maintenance procedures including a step-by-step review of the Operations and Maintenance Manual.

C. The Manufacturer shall provide written reports covering the technician’s findings and installation certification/approval shall be submitted to the Owner covering the inspection and outlining in detail any deficiencies noted and proposed corrective action of corrective procedures.

3.3 PERFORMANCE GUARANTEE

A. The Equipment Manufacturer shall warrant operation of the equipment and materials for one year following acceptance. Equipment process disruptions or failures during the warranty period shall be corrected by the Manufacturer.

END OF SECTION 46 11 76

DIVISION 46 – WATER AND WASTEWATER EQUIPMENT
SECTION 46 11 77 – RADAR LEVEL SENSORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General Conditions, Special Provisions and Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

A. This section includes furnishing and installation of a total of two (2) Radar Level sensors for Chemical level measurement in fluoride and phosphate chemical bulk tanks, as shown on the Plans and specified herein and in the Division 26 and Division 40. Provide for interface and connection to the Water Commission's SCADA system and assigned PLC for a complete and functioning installation.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 01 10 10 – Summary of Work Sequence
2. Section 01 14 00 – General Coordination
3. Section 01 33 00 – Submittals
4. Division 26 - Electrical
5. Division 40 – Process Interconnections
6. Section 46 10 00 – General Requirements
7. Section 46 61 00 – Gravity Filters

1.3 SUBMITTALS

A. Product Data: The equipment manufacturer shall provide shop drawings, details and specifications showing dimensions and details of the equipment and ancillary components specified herein.

B. Manufacturer Certification: At the time of equipment shop drawing submittal, the manufacturer shall provide a certificate stating the following:

1. The equipment meets the detailed requirements and intent of the Specifications or stating in itemized detail the variance between that specified and that being offered.
2. The equipment can be installed and will operate satisfactorily in the location as shown on the plans or stating the changes that must be made so that it can be installed.
3. A guarantee to make any necessary revisions or replace the equipment if it is determined after initial start-up that the equipment or ancillary components will not meet the detailed requirements and intent of the specifications.

C. Shop Drawings: The manufacturer shall submit shop drawings delineating the dimensions, equipment components, any wiring diagrams and all essential details. Provide list of materials and components, with quantities and features keyed to the appropriate design configuration, application and location shown on the Plans. Provide installation detail (section) showing clearances, dimensions and supports for each specific application indicated on the Plans.

D. Manufacturer shall provide installation instructions and required installation and assembly drawings to the contractor detailing all installation requirements for a complete on-line operating installation of the specified equipment and ancillary appurtenances.

E. Operation and Maintenance Manual: The Manufacturer shall submit two (2) complete copies of an Operation and Maintenance Manual compliant with Specification Section 01 33 00.

E. Factory Testing: The Manufacturer shall test the equipment to ensure proper operation and completeness of all interrelated components prior to delivery. The Manufacturer shall provide the Owner complete written results of the factory testing, certifying that the equipment operates according to specified conditions.

G. Electrical Wiring Diagrams

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Radar Level Sensors

1. Endres Hauser Micropilot FMR43 Radar Level Sensor for hygienic processes, c/o George E. Booth Co., (815) 721-3053
2. or Equal

2.2 EQUIPMENT DESCRIPTION

A. Radar level sensor shall meet the following minimum requirements:

1. Compact design for continuous non-contact level measurement.
2. Measuring Principle: Level Radar
3. Measurement Distance: 15m (49 ft)
4. Measurement Accuracy: +/- 1mm (0.04 in)
5. Material/Body construction:
   i. Main Wetted Parks: Polytetrafluoroethylene (PTFE)
6. Ambient Temperature: -40°C to 80°C (-40°F to 176°F)
7. Process Temperature: -40°C to 150°C (-40°F to 302°F)
8. Process Pressure: -1 bar to 20 bar

PART 3 EXECUTION

3.1 INSTALLATION

A. Install according to Manufacturer's instructions and Plan Drawings.

3.2 STARTUP SERVICE/CERTIFICATION

A. Manufacturer provide equipment field service engineer for a period of one day (8 hrs. on site).

B. The Manufacturer’s field service engineer shall provide assistance with questions during equipment installation, initial startup certification, initial system operating adjustments and

complete system check out. Provide instruction of operating personnel in all necessary operating and maintenance procedures including a step-by-step review of the Operations and Maintenance Manual.

C. The Manufacturer shall provide written reports covering the technician's findings and installation certification/approval shall be submitted to the Owner covering the inspection and outlining in detail any deficiencies noted and proposed corrective action of corrective procedures.

3.3 PERFORMANCE GUARANTEE

A. The Equipment Manufacturer shall warrant operation of the equipment and materials for one year following acceptance. Equipment process disruptions or failures during the warranty period shall be corrected by the Manufacturer.

END OF SECTION 46 11 77

DIVISION 46 00 00 – PROCESS EQUIPMENT
SECTION 46 11 78 – SUBMERSIBLE LEVEL TRANSDUCERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General Conditions, Special Provisions and Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

A. Furnishing, installation and calibration of a submersible level transducer in the locations shown on the Plans. Provide for interface and connection to process equipment controls for a complete and functioning installation.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 01 10 10 – Summary of Work Sequence
2. Section 01 14 00 – General Coordination
3. Section 01 33 00 – Submittals
4. Section 46 10 00 – General Requirements
5. Division 26 - Electrical

1.3 SUBMITTALS

A. Product Data: The equipment manufacturer shall provide literature, specifications and data for all components and accessories.

B. Manufacturer Certification: At the time of equipment shop drawing submittal, the manufacturer shall provide a certificate stating the following:

1. The equipment meets the detailed requirements and intent of the Specifications or stating in itemized detail the variance between that specified and that being offered.
2. The equipment can be installed and will operate satisfactorily in the location as shown on the plans or stating the changes that must be made so that it can be installed.
3. A guarantee to make any necessary revisions or replace the equipment if it is determined after initial start-up that the equipment or ancillary components will not meet the detailed requirements and intent of the Specifications.

C. Shop Drawings: The Manufacturer shall submit shop drawings delineating the dimensions, equipment components, wiring diagrams and all essential details. Provide list of materials and components, with quantities and features keyed to the appropriate design configuration, application and location as shown on the Plans. Provide installation drawings showing clearances, supports and dimensions for each specific application indicated on the Plans.

D. Manufacturer shall provide installation instructions and required installation and assembly drawings to the contractor detailing all installation requirements for a complete on-line operating installation of the specified equipment and ancillary appurtenances.

E. Operation and Maintenance Manual: The Manufacturer shall submit two (2) complete copies of an Operation and Maintenance Manual compliant with Specification Section 01 33 00.

E. Factory Testing: The Manufacturer shall test the equipment to ensure proper operation and completeness of all interrelated components prior to delivery. The Manufacturer shall provide the Owner complete written results of the factory testing, certifying that the equipment operates according to specified conditions.

G. Electrical Wiring Diagrams

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Endress+Hauser Deltapilot FMB53, c/o George E. Booth Co., (815) 721-3053.

C. Or equal

2.2 OPERATING REQUIREMENTS

A. The sensor shall measure and indicate water level in the tank. Continuous Digital Read-out shall be provided to a local NEMA 4X panel.

B. Continuous Level transmission shall also be provided to the Plant Programmable Logic Controller (PLC) for operation and to maintain a modulated level in the tank.

2.3 MATERIAL

A. Pressure transmitter for hydrostatic level measurement shall have flush mounted metallic contrite measuring cell:

a. Hermetically sealed, Condensate-resistant, climatic-proofed and with lowest temperature influences cable.

B. Solid state, head pressure type sensing transducer suitable for continuous submergence. Install bottom diaphragm face of the sensor 4-in. above the tank floor.

C. Transducer 316 stainless steel, 2 - 5/8-in. diameter molded teflon bottom.

D. Transducer element designed to withstand intermittent overpressure two times the full range being sensed.

E. The sensor shall be mounted using a cable suspension type mounting kit consisting of 2 ft long 1-in. 316 SS pipe with coupling, bolt, cable clamps, hardware and 1/8-in. x 7 x 19 SS cable in the length required. The cable shall be weighted and suspended such that vibrations or movement is minimized. Provide lateral stainless steel support guides as required. Provide a stainless-steel support bracket where noted on the Plans. The sensor support cable shall <u>not</u> carry any weight of the transducer assembly. The assembly shall allow the transducer to be easily lifted out of the wet well for cleaning or maintenance.

F. Furnish a digital panel NEMA 4X meter with numeric LEDs calibrated in “feet.” Mount on the front-hinged door of the upper assembly with a NEMA 4X clear polycarbonate cover over the meter.

G. The transducer electronic package shall be 120 VAC powered and provide 4 – 20mA signal output.

H. Provide up to 100 ft of unspliced cable from the transducer assembly to the control panel as required for the installation configurations and locations shown on the plan drawings.

I. The sensor shall be certified in writing by the Manufacturer for raw sewage or sludge wet well applications.

PART 3EXECUTION

3.1 TESTING

A. The Manufacturer shall test the equipment prior to shipment for compliance with specified performance and ship with each unit a copy of the certified test.

3.2 EXAMINATION

A. Verify site conditions

3.3 INSTALLATION

A. Install in accordance with manufacturer’s instructions and/or instruction of a competent engineer representing the Manufacturer supplying the equipment.

B. Sequence installation to ensure correct operation and function of the Liquid Level Sensors.

3.4 STARTUP SERVICES

A. The Contractor shall include with his bid the service of the Manufacturer’s field service technician for a period of one (1) day (8 hrs. on site).

B. This service shall be for the purpose of checkout, startup, installation guidance, calibration, installation certification and instruction of operating personnel.

C. A written startup certification stating adequacy of the installation and verifying correctness of the system calibration shall be submitted to the Engineer.

3.5 PERFORMANCE GUARANTEE

A. The Equipment Manufacturer shall warrant operation of the equipment, controls and materials for one year following startup and acceptance. Equipment process disruptions or failures during the warranty period shall be corrected by the Manufacturer.

END OF SECTION 461178

DIVISION 46 – WATER AND WASTEWATER EQUIPMENT
SECTION 46 11 79 – TURBIDITY SENSORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General Conditions, Special Provisions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes furnishing and installation of two (2) Turbidity sensors for in-line turbidity measurement in the filtered water from the gravity filters, as shown on the Plans and specified herein and in the Division 26 Specifications related to controls and SCADA. Provide for interface and connection to the Water Commission's SCADA system and assigned PLC for a complete and functioning installation.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 01 10 10 – Summary of Work Sequence
2. Section 01 14 00 – General Coordination
3. Section 01 33 00 – Submittals
4. Division 26 - Electrical
5. Division 40 – Process Interconnections
6. Section 46 10 00 – General Requirements
7. Section 46 61 00 – Gravity Filters

1.3 SUBMITTALS

A. Product Data: The equipment manufacturer shall provide shop drawings, details and specifications showing dimensions and details of the equipment and ancillary components specified herein.

B. Manufacturer Certification: At the time of equipment shop drawing submittal, the manufacturer shall provide a certificate stating the following:

1. The equipment meets the detailed requirements and intent of the Specifications or stating in itemized detail the variance between that specified and that being offered.
2. The equipment can be installed and will operate satisfactorily in the location as shown on the plans or stating the changes that must be made so that it can be installed.
3. A guarantee to make any necessary revisions or replace the equipment if it is determined after initial start-up that the equipment or ancillary components will not meet the detailed requirements and intent of the specifications.

C. Shop Drawings: The manufacturer shall submit shop drawings delineating the dimensions, equipment components, wiring diagrams and all essential details. Provide list of materials and components, with quantities and features keyed to the appropriate design configuration, application and location shown on the Plans. Provide installation detail (section) showing clearances, dimensions and supports for each specific application indicated on the Plans.

D. Manufacturer shall provide installation instructions and required installation and assembly drawings to the contractor detailing all installation requirements for a complete on-line operating installation of the specified equipment and ancillary appurtenances.

E. Operation and Maintenance Manual: The Manufacturer shall submit two (2) complete copies of an Operation and Maintenance Manual compliant with Specification Section 01 33 00.

E. Factory Testing: The Manufacturer shall test the equipment to ensure proper operation and completeness of all interrelated components prior to delivery. The Manufacturer shall provide the Owner complete written results of the factory testing, certifying that the equipment operates according to specified conditions.

G. Electrical Wiring Diagrams

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. In-line Turbidity Sensors

1. Endres Hauser Turbimax CUS52D Turbidity Sensor, c/o George E. Booth Co., (815) 721-3053
2. or equal

B. Turbidity Meter

1. Endres Hauser Liquiline CM442 Turbidity Meter, c/o George E. Booth Co., (815) 721-3053
2. or equal

C. Turbidity Sensor Retractable Assembly

1. Endres Hauser Cleanfit CUA451 Retractable Assembly, c/o George E. Booth Co., (815) 721-3053
2. or equal

2.2 EQUIPMENT DESCRIPTION

A. Turbidity sensor shall meet the following minimum requirements:

1. Minimum Measuring Range in Formazin Nephelometric Unit (FNU) – 0.000 FNU to 4000 FNU
2. Body Material – Stainless Steel
3. Process Pressure Range: 0.5 bar to 10 bar (7.3 psi to 145 psi)
4. Ingress Protection Rating – IP68.
5. Output/Communication – Memosens

B. Turbidity Transmitter/Meter shall meet the following minimum requirements:

1. Single Meter/Transmitter shall be capable of connecting to a minimum of two (2) independent turbidity sensors using Memosens input.
2. Housing Material
   i. Base: PC-FR
   ii. Seal: EPDM
3. Process Temperature: -20°C to 60°C (0° to 140°F)
4. Ingress Protection: IP66 / IP67

C. Turbidity Sensor Retractable Assembly shall meet the following minimum requirements:

1. Assembly shall be of manually retractable design with rinse water connections and external cleaning system.
2. Body material: Stainless Steel with Viton sealing
3. Immersion Depth: 170 mm to 270mm (6.63 – 10.53 inch)
4. Process Temperature: 0°C to 85° (32°F to 185°F)
5. Process Pressure:
   i. Manual Assembly Operation: Max. 2 bar (29 psi) for
   ii. Medium Pressure: Max. 10 bar (145 psi)

PART 3 EXECUTION

3.1 INSTALLATION

A. Install according to Manufacturer's instructions and Plan Drawings.

3.2 STARTUP SERVICE/CERTIFICATION

A. Manufacturer provide equipment field service engineer for a period of one day (8 hrs. on site).

B. The Manufacturer’s field service engineer shall provide assistance with questions during equipment installation, initial startup certification, initial system operating adjustments and complete system check out. Provide instruction of operating personnel in all necessary operating and maintenance procedures including a step-by-step review of the Operations and Maintenance Manual.

C. The Manufacturer shall provide written reports covering the technician’s findings and installation certification/approval shall be submitted to the Owner covering the inspection and outlining in detail any deficiencies noted and proposed corrective action of corrective procedures.

3.3 PERFORMANCE GUARANTEE

A. The Equipment Manufacturer shall warrant operation of the equipment and materials for one year following acceptance. Equipment process disruptions or failures during the warranty period shall be corrected by the Manufacturer.

END OF SECTION 46 11 76

DIVISION 46 - WATER AND WASTEWATER EQUIPMENT
SECTION 46 12 00 – WATER MAIN PIPING, VALVES, FITTINGS AND ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Special Provisions, and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes process piping, fittings, valves, supports and accessories necessary for installation of piping and connection to equipment and structures as shown on the Plans.

1. Section 01 10 10 – Summary of Work Sequence
2. Section 01 14 00 – General Coordination
3. Section 01 33 00 – Submittals
4. Section 09 96 00 – High Performance Coatings
5. Section 46 10 00 – General Requirements
6. Section 46 11 00 – Process Piping, Valves Fitting and Accessories
7. Section 46 11 05 – Electric Actuators
8. Division 46 – Process Equipment
9. Division 26 - Electrical

1.3 SYSTEM PERFORMANCE REQUIREMENTS

B. Minimum Working Pressure Ratings: Except where otherwise indicated, the following are minimum pressure requirements for water system piping.

1. Underground Piping, 200 psi (1380 kPa).

1.4 QUALITY ASSURANCE

C. Comply with requirements of the authority supplying water, including tapping of water mains and backflow prevention.

D. Codes and Standards: Comply with the requirements of the latest edition of the following:

2. Standard Specifications for Water and Sewer Main Construction in Illinois, Eighth Edition, hereinafter referred to as the Standard Specifications, shall apply as modified below and by the Special Provisions Modifying these Standard Specifications.

a. Pertinent standard drawings contained in the Specifications shall also apply except as modified in the Special Provisions or on the Plan Sheets.

1.5 SUBMITTALS

A. Manufacturers' literature and shop drawings demonstrating compliance with this Specification.

B. Submittals required by this section shall be made in one (1) group for review by the Engineer.

C. Contractor shall provide a piping layout, shop drawing and schedule of materials for all proposed piping, fitting, valves and supports 8-in. diameter and larger between process units and between process units and equipment. All piping installation shall be provided with flexibility to allow removal and re-installation of select piping and fittings.

D. Provide a tabulated schedule identifying valve or pipe size, type, location, Plan Sheet and accessories. A submittal with a general list of materials that does not identify specific locations of the equipment will be rejected.

E. Operation and Maintenance Manual: The Manufacturer shall submit two (2) complete copies of an Operation and Maintenance Manual and an electronic copy per Section 01 33 00 – Submittals. The manuals shall be in a 3-ring binder and be sectioned by component with appropriate indexing. Addresses, phone numbers and points of contact for repair and replacement equipment parts and service shall be included.

PART 2 PRODUCTS

2.1 WATER MAIN (Site Piping)

A. Ductile Iron Pipe (D.I.)

1. Latest edition AWWA C-151/C21.51. Cement lining, ANSI/AWWA C-104/A21.4;

a. Class 52 or as noted. Joints Mechanical ANSI/AWWA C-111/A21.11 (Below Ground). All fittings shall be restrained by a mechanical device. Fittings, Latest edition ANSI/AWWA C-110

2.2 VALVES AND ACCESSORIES

A. Tapping Valve and Sleeve

1. Tapping sleeve shall be manufactured in the U.S.A. and the sleeve shall be three hundred four (304) stainless steel body with a ductile iron flange that has a rubber seal. The sleeve shall have a full gridded SBR rubber gasket that wraps completely around the pipe for the full length of the sleeve. All nuts and bolts shall be three hundred four (304) stainless steel. The sleeve shall have a built-in tolerance for variances in type and class for each pipe material as shown on the material proposal. All tapping sleeves shall be furnished with a three hundred four (304) stainless steel 3/4" NPT test plug for pressure testing and have a locator groove on the mating surface between tapping valve and sleeve to allow for positive alignment. Tapping Sleeve shall be ROMAC, POWERSEAL or MUELLER

B. Gate Valves

1. Non-rising stem gate valves 12" (600 mm) and smaller –Mueller A-2360; AWWA C-515 resilient wedge with restrained, mechanical joints compatible with pipe furnished.
2. Non-rising stem gate valves 14-24" (600 mm)–Mueller A-2360; AWWA C-515 resilient wedge with restrained, mechanical joints compatible with pipe furnished. With bevel gear operator for direct bury of valve on its side.
3. Valve boxes: Screw adjustable and cast iron with "WATER" on the cover.

C. FIRE HYDRANT

1. Dry-barrel fire hydrants: AWWA C-502
2. 3-Way Fire Hydrant (6") (150 mm) inlet as shown on the Plans.
4. Joints to be restrained from the hydrant through the main.
4.. Mueller Super Centurion 250, A-423, 5 ¼" three way. The City will only accept an equal if pre-approved.

D. MECHANICAL JOINT RESTRAINT DEVICES

1.. Mechanical Joint Fitting Restraint Devices for both Ductile Iron Pipe and PVC shall have the restraint of mechanical joints incorporated into the follower gland and shall include a mechanism to impart multiple wedging action that increases with increasing pipe pressure. Follower glands shall be manufactured of ductile iron in accordance with ASTM A536.

2. Dimensions of the follower gland shall conform to and shall be compatible with mechanical joints in accordance with ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53.

3. The device shall be rated for a minimum of 250 psi working pressure and a minimum safety factor of 2:1. The device shall incorporate torque nuts that twist off to assure proper torque is applied when installing.

5. Manufacturers shall be Romac, EBAA Iron, Uni-Flange or Tyler Union.

E. FLEXIBLE EXPANSION JOINT

1. Flexible expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile iron conforming to the material requirements of ASTM A536 and ANSI/AWWA C153/A21.53. Foundry certification of material shall be readily available upon request.

2. Each flexible expansion joint shall be pressure tested prior to shipment against its own restraint to a minimum of 350 PSI for 3 inch through 16 inch and 250 PSI for 18 inch and greater. A minimum 2:1 safety factor, determined from the published pressure rating, shall apply.

3. Each flexible expansion joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of: 20º for sizes 4-inch through 12-inch; 15º for sizes 14-inch through 36-inch and 12 º for size 48-inch. The flexible expansion fitting shall not expand or exert an axial imparting thrust under internal water pressure. The flexible expansion fitting shall not increase or decrease the internal water volume as the unit expands or contracts. The minimum total linear travel shall be 8-inches.

4. All internal surfaces (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213. Sealing gaskets shall be constructed of EPDM. The coating shall meet ANSI/NSF-61.

5. Exterior surfaces shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C116/A21.16.

6. Polyethylene sleeves, meeting ANSI/AWWA C105/A21.5, shall be included for direct buried applications.

7. Manufacturer's certification of compliance to the above standards and requirements shall be readily available upon request. The purchaser (or owner) shall reserve the right to inspect the manufacturer's facility for compliance. All flexible expansion joints shall be The Force Balanced FLEX-TEND as manufactured by EBAA Iron, Inc. Eastland, TX., U.S.A.

PART 3 EXECUTION

1.3 INSTALLATION

A. Pipe shall be installed in accordance with the plans and above referenced specifications except as modified below.

B. Installation shall be in accordance with manufacturer's instructions.

C. All pipe shall be tested per Section 41.2.14 and 42.2.15 of the Standard Specifications for Water and Sewer Construction in Illinois, 8th Edition. Minimum test pressure of 1.5 x static pressure or 100 psi (620 kPa), whichever is greater. Pressure test shall be held for one hour and no leakage is allowed.

B. All Traffic Control measures, layout and equipment shall be in accordance with the Illinois Department of Transportation standards for Traffic Control. Traffic Control will not be paid for separately but included in the unit price of the water main.

C. All excavated material shall be loaded into trucks or other means of removing the excavated

material.

1.4 EXISTING UTILITIES

A. Joint Utility Location Information for Excavators: Call the toll-free J.U.L.I.E. telephone number, 1-800-892-0123, before starting excavation. Allow 48 hours for other than emergency assistance. It shall be the Contractor's responsibility to locate or have located all utilities.

1.5 RIGHT-OF-WAY

A. Working Right-of-Way: The Contractor shall confine his operations to the limits of the working right-of-way and easements as shown on the plans. He will be held responsible for any damage to adjacent property not within the limits of the right-of-way.

1.6 PIPING INSTALLATION

A. Disconnecting Existing Water Mains: Where shown on the plans, the existing water mains shall be disconnected. The separation shall be made in one of two ways. It may consist of removing the water main from an existing valve or fitting and plugging the opening, or the Contractor may remove a section of the main, including the fitting, install two sleeves, and a short length of pipe.

B. Connect Existing Service to New Main: Where existing water mains are to be abandoned, the existing services shall be disconnected from the existing water main and reconnected to the proposed water main after the proposed water main is constructed, tested, sterilized, and placed into service. The work shall include furnishing and installing a corporation stop in the new main with saddle, cutting and disconnecting the existing service from the old main, plugging the existing service at the point of connection to the existing water main, and connecting the service pipe to the new corporation stop.

C. Tracer Cable: Furnish and install a direct bury #12 THWN single strand copper electrical cable suitable for direct burial with 4-inch (100 mm) and larger proposed water mains. Cable to be taped or attached in an approved manner to all water mains during installation and prior to backfilling. Cable shall extend continuously up through all test stations to a point 2-feet (600 mm) minimum above finish grade. No field splices permitted except above ground at test stations. All test stations shall be located at each hydrant or determined by the Engineer.

1.7 FIELD QUALITY CONTROL

A. Construction Observation and Inspection: Owner will employ a qualified engineering agency or staff to perform construction observation and inspection.

B. Disinfection of Water Mains

1. Flushing of new mains: There will be no charge by the Owner to the Contractor for the water used to flush the mains, chlorinate, and flush the mains a second time. If it is necessary to flush the mains more than twice as noted, Contractor will be charged by the Owner for water used to flush the mains. Contractor shall provide and install any hose necessary to direct the water being flushed away from any area it might damage.

C. Final Flushing and Testing

1. All samples must be collected by the Contractor and observed by a designated sample collector of the Owner and tested at an EPA approved laboratory. Contractor shall transport the samples to the laboratory and pay all lab fees.

2. Water mains that fail the initial bacterial test shall be flushed again before additional sampling is commenced. If the second sample also fails the bacterial test, disinfection shall be repeated and the main flushed again prior to the third sampling. If the third sample fails the bacterial test, the next step shall be determined by the Owner and the Engineer. All sterilization shall be performed with a designated representative by the Owner in attendance.

   Test results shall be mailed or emailed scans to the Engineer. Water sample bottles shall be furnished by the laboratory.

1.8 CLEAN UP

A. Excess Excavation: All excess excavated materials shall become the responsibility of the Contractor for disposal off the construction site as approved by the Engineer except that the Owner reserves the right to have selected excavated materials deposited at designated locations within the City Limits at no additional cost to the Owner.

B. Property of the Owner: All pipe fittings, valves, hydrants and accessories removed from the existing mains shall become the responsibility of the Contractor for disposal off the construction site, except that the Owner reserves the right to have selected excavated materials (including pipe, hydrants, etc.) delivered to a location specified by the Owner at no additional cost to the Owner.

END OF SECTION 46 12 00

DIVISION 46 – WATER AND WASTEWATER EQUIPMENT
SECTION 46 19 30 – PRESSURE TRANSDUCER

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General Conditions, Special Provisions and Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

A. Furnishing, installation and calibration of in-line pressure transducers in the locations shown on the Plans. Provide for interface and connection to process equipment controls for a complete and functioning installation.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 01 10 10 – Summary of Work
2. Section 01 14 00 – General Coordination
3. Section 01 33 00 – Submittals
4. Section 46 10 00 – General Requirements
5. Section 46 11 00 – Process Piping, Valves, Fittings and Accessories
6. Division 26 - Electrical

1.3 SUBMITTALS

A. Product Data: The equipment manufacturer shall provide literature, specifications and data for all components and accessories.

B. Manufacturer Certification: At the time of equipment shop drawing submittal, the manufacturer shall provide a certificate stating the following:

1. The equipment meets the detailed requirements and intent of the Specifications or stating in itemized detail the variance between that specified and that being offered.

2. The equipment can be installed and will operate satisfactorily in the location as shown on the plans or stating the changes that must be made so that it can be installed.

3. A guarantee to make any necessary revisions or replace the equipment if it is determined after initial start-up that the equipment or ancillary components will not meet the detailed requirements and intent of the Specifications.

C. Shop Drawings: The Manufacturer shall submit shop drawings delineating the dimensions, equipment components, wiring diagrams and all essential details. Provide list of materials and components, with quantities and features keyed to the appropriate design configuration, application and location as shown on the Plans. Provide installation drawings showing clearances, supports and dimensions for each specific application indicated on the Plans.

D. Manufacturer shall provide installation instructions and required installation and assembly drawings to the contractor detailing all installation requirements for a complete on-line

operating installation of the specified equipment and ancillary appurtenances.

E. For manufacturer/vendor supplied control panel specified, comply with Specification Section 46 10 30 – Programmable Logic Controllers and 46 10 40 – Control Panels. Submit, for the Owner's maintenance use on the Robinson Palestine WTP site only, a fully documented and tagged I/O (Control Process Input and Output) tabulated list and a fully documented copy of the PLC Ladder Logic Program operating the equipment via the specified Allen-Bradley PLC.

F. Operation and Maintenance Manual: The Manufacturer shall submit two (2) complete copies of an Operation and Maintenance Manual and an electronic copy per Section 01 33 00 – Submittals. The manuals shall be in a 3-ring binder and be sectioned by component with appropriate indexing. Addresses, phone numbers and points of contact for repair and replacement equipment parts and service shall be included.

G. Factory Testing: The Manufacturer shall test the equipment to ensure proper operation and completeness of all interrelated components prior to delivery. The Manufacturer shall provide the Owner complete written results of the factory testing, certifying that the equipment operates according to specified conditions.

1.4 QUALITY ASSURANCE

A. To assure the equipment has an appropriate range, submit shop drawing for the in line level pressure transduces.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. For Inside Applications (High Service Pump Forcemain)
   a. Endress+Hauser Cerabar PMP51B – Pressure Transmitter, C\O George E. Booth Company, (815) 306-1800.
   b. Or Equal.

B. For Outside Application (Ground Storage Tank Pressure Transducer Vault)
   a. Endress+Hauser Cerabar PMP21 – Pressure Transmitter, C\O George E. Booth Company, (815) 306-1800.
   b. Or Equal.

2.2 PRESSURE TRANSDUCER SCHEDULE

A. In-line Pressure Transducers shall be installed as shown on the drawings in the following locations
   a. Location: Robinson-Palestine High Service Pump Forcemain Manifold
      i. Quantity: 1
      ii. Model: E+H PMP51B, or equal.

   b. Location: Trimble High Service Pump Forcemain
      i. Quantity: 1
      ii. Model: E+H PMP51B, or equal.

c. Location: head Tank Pressure Transducer Manhole
   i. Quantity: 1
   ii. Model: E+H PMP21, or equal.

2.3 SEQUENCE OF OPERATIONS & CONTROLS

A. The pressure transducers on the Robinson-Palestine high service pump manifold and the Trimble high service pump forcemain shall measure gauge pressure and report back to the plant SCADA system.

B. The pressure transducer located in the Ground Storage Tank Pressure Transducer Vault, shall measure gauge pressure. The gauge pressure shall be converted into feet of water head through the local PLC and reported back to the plant SCADA system. The following operations sequences shall also be programmed into the Plant PLC based on level measurements from the transmitters.

1. Ground Storage Tank (adjust levels per the approved tank shop drawing)
   a. Overflow Alarm at elevation 519.00’
   b. Tank Full Alarm – Low Service Pump Shut Off at 518.50’
   c. Low Water Level Alarm at 487.00’
   d. Low-Low Water Alarm – High Service Pump Shut off at 483.00’

2.4 MATERIAL

A. Each level transmitter assembly shall be hydrostatic head pressure type consisting of a flush mounted pressure sensor installed on a 3-inch, 150-pound ANSI flanged mounting.

B. Unit shall have an integral transmitter, electronic, two wire type, 4-20mA output, capable of operating with supply power of 13 to 35 VDC. Electronics shall be industrial grade rated for -20 F to 185 F operation.

C. Each unit shall consist of a carbon steel body with stainless steel wetted parts.

D. Measuring element shall be resonant wire or strain gauge type. Force balance type is not acceptable.

E. Electronics enclosures for digester tank level transmitters shall be suitable with the NEC for Class 1, Group D, Division 2 locations.

F. Electronics enclosures for polymer tank level transmitters shall be NEMA 4X rated.

G. Provide zero span and dampening adjustments.

H. Accuracy, including hystersis, linearity, and temperature error shall be within ±0.25% of sensor range.

I. Transmitters shall have an isolated output signal of 4 to 20 mA dc into a minimum load range of 0-600 ohms at 24Vdc.

J. Provide all mounting brackets, pipe stands, and accessories required to install all field-mounted instruments.

PART 3 EXECUTION

3.1 TESTING

A. The Manufacturer shall test the equipment prior to shipment for compliance with specified performance and ship with each unit a copy of the certified test.

3.2 EXAMINATION

A. Verify site conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer’s instructions and plan drawings.

B. Sequence installation to ensure correct operation and function of the level transmitters

3.4 STARTUP SERVICES

A. The Contractor shall include with his bid the service of the Manufacturer’s field service technician for a period of one (1) trip of one (1) day.

B. The manufacturer shall credit to the owner, all unused service man days specified above, at the manufacturer's published field service rate.

C. This service shall be for the purpose of checkout, startup, installation guidance, calibration, installation certification and instruction of operating personnel.

D. A written startup certification stating adequacy of the installation and verifying correctness of the system calibration shall be submitted to the Engineer.

3.5 PERFORMANCE GUARANTEE

A. The Equipment Manufacturer shall warrant operation of the equipment, controls and materials for one year following startup and acceptance. Equipment process disruptions or failures during the warranty period shall be corrected by the Manufacturer.

END OF SECTION 46 19 30

DIVISION 46 – WATER AND WASTEWATER EQUIPMENT
SECTION 46 31 11 – CHLORINE GAS FEED EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the contract including, but not limited to, General Conditions, Supplementary Conditions and Division 01 Specification Sections apply to this section.

B. Related sections to this specification, include but may not be limited to, the following:

1. Section 01 11 00 – Summary of Work
2. Section 01 33 23 – Shop Drawings, Product Data and Samples
3. Section 26 05 00 – Common Work Results for Electrical
4. Section 40 23 19 – Process Piping and Accessories
5. Section 40 90 20 – Instrumentation

1.2 SUMMARY

A. Gas Chlorination Systems

1. Furnish and install two (2) gas chlorination systems including vacuum feed equipment, chlorine safety sensor, scales, tank holders, safety valves, test equipment and related appurtenances, as indicated on the contract drawings and specified herein.

2. Each gas chlorine system (2) shall include two (2) chlorine cylinders (150 lb cylinders to be furnished by Owner) mounted on platform scales. Each cylinder shall be equipped with a vacuum regulator with automatic switchover capability, which allows automatic change from an exhausted gas source to a fresh source without operator attention or action.

3. The chlorine gas under vacuum shall travel through a pressure relief/vent valve to an automatic valve assembly (remote gas flow meter, automatic positioning valve with valve controller) where the feed rate shall be regulated based on the SCADA input signals from the plant (flow meter rate, chlorine dosage rate, and/or chlorine analyzer levels). The gas will continue to the pressure ejector with check valve assembly where it is mixed into solution with water from the distribution system, before it is directly injected into the water at the chemical injection points at the plant

B. Provide a Chlorine Gas (leak) Detector to continuously monitor the ambient air in the chlorine room, sound an alarm and initiate safe ventilation of the room when a leak is detected.

C. Provide an Emergency Chlorine Gas Shutoff System that when initiated by the detection of a chlorine gas leak will close all gas cylinder actuator valves.

D. Provide an Emergency Gas (Chlorine) Scrubber System that when initiated by the detection of a chlorine gas leak will shut down chlorine room ventilation and extract the chlorine room air to the scrubber media to safely absorb the chlorine gas. System shall include media, blower assembly, blower control and starter panel, and appropriate

connections for external duct work, as indicated on the plan drawings and specified herein.

E. Provide a Chlorine Room Ventilation Control System as detailed on the Electrical Drawings to control the Chlorine Room lights and ventilation equipment.

1.3 QUALITY ASSURANCE

A. The equipment and materials to be furnished under this Contract shall be free from defects. The complete gas feed system shall be furnished by one (1) manufacturer having complete system responsibility for the operation of the system.

B. The gas feed equipment shall be manufactured and tested under ISO certification meeting the following standards: ISO9001-1994, EN ISO9001-1994, ANSI/ASQC9001-1994.

C. All electrical devices shall be provided with an EC declaration of conformity relating to electromagnetic compatibility where required.

F. All equipment, piping and accessories shall meet Chlorine Institute recommendations.

G. Preinstallation Conference: Conduct conference at Project site.

1. Meet with the Owner, Engineer, equipment manufacturer's representative, and subcontractors whose work interfaces with or affects installation and placement of the equipment.

2. Review methods and procedures related for installation, including manufacturer's written instructions.

3. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Examine condition of equipment and finishes for compliance with the specifications and manufacturer's instructions.

5. Review installation and placement of the equipment and coordination with piping and conduits, electrical and HVAC within the chlorine room in conformance with the specifications and the manufacturer's instructions.

6. Review piping layout and connections, including placement of gas chlorine system components, valves, meters, fittings.

7. Review installation and coordination of the controls and instrumentation for the overall system and individual components, coordination and placement of instrumentation and control panels.

8. Review start-up, testing and calibration procedures for the equipment in conformance with the specifications and the manufacturer's instructions.

1.4 REFERENCE STANDARDS

A. The work in this section is subject to the requirements of applicable portions of the following standards:

1. Ten States Standards
2. Illinois EPA Design Standards
3. NSF Regulations

4. OSHA Rules and Regulations

1.5 SUBMITTALS

A. Submittals shall be as specified in the General Conditions and Section, General Requirements.

B. Submit the following:

1. Sufficient information on each component to show that the equipment meets this specification.

2. Dimensional drawings as required for the installation.

3. Electrical wiring diagrams as required for the installation.

4. Scrubber Media Analysis confirmation testing shall be performed. Manufacturer shall provide test results showing that the media that will be supplied is capable of maintaining a continuous air discharge containing less that 1 ppm Cl2 concentration throughout the test. The test is meant to simulate the release and subsequent chlorine removal from a catastrophic tank failure.

C. Operation and Maintenance Manuals: The Manufacturer shall submit eight (8) complete copies of an Operation and Maintenance Manual.

1.6 DELIVERY, STORAGE AND HANDLING

A. The Contractor shall be responsible for the delivery, storage and handling of products in accordance with the manufacturer's recommendations.

1.7 WARRANTY REQUIREMENTS

A. All equipment, unless otherwise stated, shall be warranted by the manufacturer for 12 months from date of start-up not to exceed 18 months from date of shipment.

1.8 SUPERVISION

A. The Contractor shall arrange for the equipment manufacturer to provide a qualified field representative as required for the purpose of checking installation, start-up, final field acceptance testing, and providing instruction to the Owner’s operating personnel in the proper operation and maintenance of the equipment in this section.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Gas Chlorination Equipment

1. Superior Chlorinators, Chemical Injection Technologies (CIT), Inc.

a. Series CL-26 250 PPD

b. Vacuum Regulators: Model VR-26
c. Gas Flow Control Valves: RM-2
d. Vent Valve SPR-2
e. Chlorine Gas Detector: Model SLD-1-CL
f. Emergency Chlorine Gas Shout-off System: Safe-T-Close

2. Capital Controls equipment, DeNora Water Technologies, Inc.
   a. Equally sized and performance requirements/criteria
3. Or equal

B. Chlorine Scales

1. Chlor-Scale 150®, Model WR150-2, with TUF-COAT coating and Wizard 4000 digital display, Force Flow, Inc. (Note Two (2) load cells that can measure independently two (2) cylinders each for a total of 4 cylinders.)
2. Or equal

C. Emergency Gas (Chlorine) Scrubber System

1. Pure Air Filtration, LLC of Norcross GA, Model: EGS 150
2. Or Equal

2.2 DESIGN CRITERIA

A. The gas chlorine feed equipment shall be in accordance with Section 4.3 and Part 5 of the Recommended Standards for Water Works, latest edition (Ten States Standards).

B. The gas chlorine feed equipment target doses and required capacities shall be as follows:

Chemical	Target Dosage	Feed Capacity	#Units Req'd
Pre-Chlorination	2.0 mg/l	200 ppd	1
Post-Chlorination	1.5 mg/l	200 ppd	1

C. Emergency Gas (Chlorine) Scrubber System

Design Chlorine Scrubber Flow Rate:	500 cfm (minimum)
Portable Tank Temperature:	160°F
Draft Across the Scrubber (for duct loss):	1-1/2" W. C.
Max/Min Temperature for Scrubber Tank:	200/-40F
Max. Exhaust Concentration:	1 ppm
Power Supply:	480 V, 3-phase, 60 Hz

2.3 CHLORINATION EQUIPMENT

A. The gas chlorination system required shall include vacuum solution feed type gas chlorinators having a maximum capacity of 200 pounds per 24 hours. The control unit will contain a remote rate valve/metering tube calibrated from 0 to 200 pounds per 24 hours with a ± 4% accuracy over the indicated flows. Gas flow rates shall be controlled by varying the position of a flow rate adjusting valve.

B. An automatic switchover system using self-actuating vacuum regulators shall be provided. Each chlorine vacuum regulator shall contain its own built-in switchover mechanism. One vacuum regulator diaphragm shall be in standby mode while one regulator is in the operating mode feeding chlorine gas. When the chlorine supply is depleted in the operating cylinder, vacuum shall build up in the system. This shall cause the diaphragm in the standby regulator to be pulled back, overcoming the latching mechanism and opening the inlet valve. Chlorine shall then be drawn from the standby

cylinder to satisfy the increased system vacuum, and the vacuum will return to the operating level.

C. Each vacuum regulator shall be connected by vacuum tubing to a pressure relief/vent valve that shall be wall mounted and vented to the outside of the building. The vent line shall terminate in an area where gas fumes cannot cause damage or injury to personnel. The vent lines shall not terminate at a location routinely used by personnel such as work areas or pathways, nor near windows or ventilation system intakes.

D. The pressure relief/vent valve shall be connected by vacuum tubing to the remote rate valve/metering tube. The remote rate valve/metering tube shall then connect to the pressure ejector/check valve assembly. This assembly shall also have a single piece venturi/nozzle to connect a 1" non-potable water supply line. The 1" non-potable water supply line shall have a ball valve, strainer and glycerin filled pressure gauge with a built-in pressure snubber and a 3 1/2" minimum diameter clear glass face capable of reading from 0 – 100 psi with graduating marks every 1 psi.

E. The Pre-chlorination output line shall connect to a 1" PVC Schedule 80 pipe water line that shall exit the chlorine room beneath the concrete floor and extend buried across the site over to resurface adjacent to the aerator/reaction tank to the injection point on the ductile iron raw water main (above grade). The exterior exposed (above grade and buried down to 4' depth) portions of this 1" piping shall be insulated and protected with aluminum casing as shown on the plan drawings and as specified.

F. The post-chlorination output line shall connect to a 1" PVC Schedule 80 pipe water line that shall exit the chlorine room through the wall and extend overhead to the injection point on the ductile iron high service main.

2.4 GAS FLOW CONTROL VALVE (AUTO VALVE)

A. The Contractor shall provide gas flow control valve rated for 250lbs/day for automatic flow proportioning, residual, and compound loop control of the chlorine gas. This valve controller shall require a 4-20mA signal from the water flow meter and 120VAC power supply.

B. The control valve shall provide the following options to the operator:

1. "Low Flow" alarm setpoint.
2. 4-20 mA output signal to allow for transmission of the valve position to monitor with the SCADA system.
3. Input signal filtering to allow user adjustment of the controller's sensitivity to very small changes in the input signal to eliminate "pulsing" signals.
4. Easy adjustments of dosage rates and residual setpoints.
5. Manual control mode for quick and easy adjustments of the gas feed rates from the control panel should the flow meter input signal be lost.

2.6 CHLORINE ANALYZER

A. The Contractor shall provide and install a chlorine analyzer as shown on the plans, to continuously monitor finished water for free chlorine. The analyzer shall perform an analysis every 2.5 minutes, 24 hours a day.

B. The analyzer shall not require any reagents for the measurement of free chlorine in the finished water

C. The analyzer sample draw line pressure shall not exceed maximum recommended sample line pressure from the manufacturer.

D. The chlorine analyzer assembly shall be mounted at eye level and all components of the analyzer skid, including sensors, HMI, sample tube, shall be sourced from a single manufacturer.

E. Acceptable Manufactures:

a. APFCL – Chlorine Analyzer Panel by Blue-White Industries.

b. Or Equal.

2.7 CHLORINE GAS DETECTOR

A. A chlorine sensitive modular self-checking gas detector shall be provided to continuously monitor the ambient air for chlorine gas. The detector shall have remote sensing capability, shall operate amperometrically, shall consist of a receiver module, a NEMA 4X enclosure and a remote sensor/transmitter with sensor auto test. The receiver module shall include a battery backup with charger. The system shall detect 0 to 10 PPM in 0.1 PPM increments and shall have two (2) adjustable level alarm settings for “warning” and “danger” gas levels. The receiver module shall have a red “danger” alarm light, an amber “warning” light, a red trouble light, and a manual reset switch. The detector shall be connected to the control system and include an isolated 4-20 mA analog output.

B. The Chlorine Gas (leak) Detector shall be interlocked with the Emergency Gas (Chlorine) Scrubber, Emergency Chlorine Gas Shutoff System and Chlorine Room Ventilation Control System to operate if a chlorine leak occurs. Provide an audible horn mounted within the process room and connected to the detector to alarm a chlorine gas leak event.

C. One (1) automatic system for discharging the chlorine cylinders shall be provided. The system shall include actuators mounted to each chlorine cylinder and a remote-control panel. Each actuator shall be controlled by a remote leak detector and shall be wired using quick connectors and have digital I/O for connection to terminals of the SCADA system. No permanent connecting wires or hoses between the actuator and other devices are acceptable.

2.8 CHLORINE SCALES

A. Two (2) dual chlorine scales shall be provided and shall be of the digital readout/electronic load cell type. Scale platform shall be constructed of non-corrosive PVC plastic and sized to accept 150 lb. cylinders from 10¼" (260mm) to 10½" (267mm) in diameter. Platform height shall be no more than 1-5/8" (38mm) to allow easy handling and unloading of cylinders. Platform scale coating system shall be a minimum dry thickness of 80 mils and be resistant to moisture, chemicals, abrasion, impact and UV light.

B. Scale shall be of the single load cell design. Weight shall be transferred via a pivoted platform to a single stainless steel canister load cell of the electronic strain gauge type. Load cell shall be mechanically sealed with O-rings. Potted-type load cells shall not be accepted. Flexible cable shall connect load cell to indicator to allow easy remote installation of the readout. Cable length shall be 10 feet. Cylinder chaining bracket shall

be wall mounted and use a double coil chain and a spring-loaded snap hook to secure cylinder. Chaining bracket shall have an integral tool rack for storing cylinder change-out tools.

C. Indicator shall monitor 4 channels. The remote mounted LCD indicator shall carry CE marking and shall be housed in a NEMA 4X, UL approved enclosure. All operations shall be keypad operated & menu driven in to avoid compromising the NEMA 4X seal at any time. The alphanumeric LCD readout shall have backlighting for readability in low light conditions. Power requirement shall be 110 VAC.

D. DISPLAY & INVENTORY CONTROL SOFTWARE: Keypad and Menu items shall have independent password protection to prevent unauthorized operation. Both a numerical and a bar graph display shall give operator the ability to monitor chemical by weight, volume or percent full. Each channel shall have a user selectable, 2-digit scale ID number and shall display net remaining, pure chemical remaining, feed rate, daily usage, total amount used, days until empty, gross weight and tare weight. A TANK LOAD key shall pause & project usage accumulation during chemical re-supply to maintain accurate usage data over multiple tank loads. A data log shall store the DAILY USAGE for each of the previous 31 days. Indicator re-calibration in the field shall be accomplished through the keypad and shall not require the use of dead weights.

E. Indicator shall output net weight via a 4-20mA signal and full scale output shall be user adjustable via the keypad. Indicator shall have four (4) adjustable set points to display low or high level conditions on the indicator.

F. Scale shall carry a full five (5) year factory warranty. “Limited” Warranties shall be considered unacceptable. Full scale accuracy shall be better than 1%.

2.9 EMERGENCY CHLORINE GAS SHUT-OFF SYSTEM

A. Remote Control Panel

1. One (1) wall-mounted control panel shall be provided to control the four (4) actuators.

2. The enclosure shall be fiberglass or polycarbonate and designed to meet a NEMA 4X rating.

3. Doors shall be sealed with stainless steel screws and latches. Enclosure accessories shall include hasp and staple for padlocking, and oil resistant gasket for positive seal.

4. The enclosure shall house microprocessor-based controller boards for each of the actuators.

5. The enclosure shall house terminals to connect to each actuator, terminals for power supply, and terminals for remote contact inputs from leak detectors or panic buttons. The remote leak detector signal shall latch close all actuators.

6. Input-output boards for each actuator shall be installed on the respective controller board with necessary hardware and ribbon cables and shall accept three (3) input signals and send four (4) output signals. Input signals shall be to close, or latch-close the respective actuator. Output signals shall be valve open, valve closed, leak, or failure of the respective actuator.

7. The enclosure shall also include batteries, dual battery charger, isolation relay, power light, panic button, and terminals for connection to the SCADA PLC or in plant computer.

8. The batteries and automatic battery charger shall be designed to operate four (4) actuators simultaneously and maintain operation of the actuators for a minimum of four (4) hours in the event of power failure.

9. All wire and terminals shall have a minimum voltage rating of 300 volts. Wires should be routed in plastic channels with covers to provide a clean and uncluttered appearance.

10. Terminals shall be provided for field connection of actuators, incoming 120 VAC power, and seven (7) signals per actuator from SCADA PLC. Furnish 10% spares.

B. Actuators

1. Four (4) cylinder mounted actuators shall be provided that are microprocessor based and have an electric motor that rotates the valve stem toward open or closed position. The actuator shall deliver 40-50 ft-lbs of closing torque to the valve stem upon receipt of an emergency shutdown signal. The actuator shall be powered only in the closing direction. An uninterruptable power supply and computer controller shall supply power for the actuators.

2. The actuator enclosure shall be fiberglass and designed to meet NEMA 4X rating. Hardware shall be non-corrosive.

3. The actuators shall be controlled by the remote control panel, as the process requires and powered from the 24 VDC battery supply.

4. Each actuator shall include a 30-foot signal cable with connector to easily detach the cable from the actuator. The connector assembly shall be corrosion resistant and sealed to prevent corrosive gases from entering the enclosure.

5. Each actuator shall have mounting hardware to facilitate mounting to the cylinder valve without contacting any discharge hardware or dispensers. Attachment to the discharge hardware may permit or promote leaks in gaskets and is not acceptable. The hardware shall permit the operator to install or remove the actuator quickly and without the need for tools or wrenches.

6. Each actuator shall have an integral keypad with sealed pushbutton switches to support closing the valve while standing at the cylinder. The keypad will also permit alignment and acknowledge any alarms.

7. A contact closure on the close input will cause the actuator to close the valve entirely. The same reaction will occur if the integral close pushbutton is depressed.

8. A minimum of two (2) spare batteries and three (3) instruction books with parts lists shall be furnished.

9. Equipment manufacturer shall provide a minimum of one (1) day start-up and training by factory-trained personnel.

2.10 ACCESSORIES

A. Vacuum gauge per manufacturer's recommendation shall be provided with chlorination feed system.

B. Storage wall bracket shall be provided for six (6) standby 150 lb. chlorine cylinders with chain to secure in place.

C. Safety kit shall be provided including gloves, apron, goggles and respirator.

D. Handheld Colorimeter, Hach DR 900 or equal, shall be provided and delivered to the Owner.

E. Appropriate danger signs as recommended by the equipment manufacturer shall be provided and mounted.

F. Respiratory protection equipment meeting the NIOSH requirements shall be provided to the Owner and shall be mounted at a location designated by the Engineer in accordance with Section 5.3.2 of the Recommended Standards for Water Works, 2012 edition. Contractor shall supply one (1) set of breathing apparatus, oxygen tank, mask and safety goggles and gloves, along with supply cabinet. Safety equipment and cabinet to be installed adjacent to chlorine room.

2.11 EMERGENCY GAS (CHLORINE) SCRUBBER SYSTEM

A. General and vessel/blower

1. The Emergency Chlorine Gas Scrubber (ECGS) shall be configured to allow discrete sampling of the media beds to determine the extent of spent media in the direction of airflow, and to allow replacement of the spent media without removing and replacing the entire media column/bed.

2. The blower shall be sized to draw a minimum of 1000 cfm initial airflow through the scrubber system, under ambient air conditions and for 100% saturated air at 100ºC; and to assure sufficient air/Cl_2 mixture flow, under maximum Cl_2 release conditions, to maintain a partial vacuum throughout the Cl_2 storage room. The manufacturer shall verify that the blower size is sufficient based on the attached drawings, and recommend any changes to the sizing.

3. Blower static pressure rating, on air, and at standard conditions, should be sufficient to achieve the intended minimum mixture flow rate, based on operational test results.

4. The ECGS shall lower the concentration of chlorine in a storage room to 1 ppm after the chlorine-generating leak has stopped. The maximum allowable discharge chlorine concentration will be ½ of IDLH limit or 5 ppm meeting the requirement of the Uniform Fire Code.

5. The entire system shall be a skid mounted, packaged system. The major components of the scrubber system, starting at the air inlet end, shall include:

   a. 4'H x 3'W x 12'L FRP vessel with deep media beds.

   b. Corrosion Resistant Media Support Grids and Media Bed(s).

   c. Safetysorb dry chlorine media.

   d. Corrosion Resistant Discharge Plenum with circular discharge duct connection (for blower inlet).

   e. Media bed monitoring rods.

   f. Electronic Media Bed Monitor panel (EBM)

g. Blower-Motor Assembly.

h. Scrubber Control and Starter Panel loose for remote mounting.

6. The scrubber vessel shall be a horizontal, PureAir ECGS-H or engineer approved equal, 4'H x 3'W x 12'L, fabricated of FRP (Hetron 922, or Derakane 41 1 Vinyl Ester Resin with an MEKP cure system). The vessel shall be skid mounted complete with a FRP blower. Media shall be supported by chlorine resistant perforated screen. The perforated screen shall be supported along the internal walls of the vessel by FRP angles integrally bonded to the vessel walls. In addition, the span of the perforated screen shall be supported by three uniformly spaced rectangular beams. The beams shall be integrally bonded to-the vessel sidewall for maximum support.

7. The resin used shall be suitable for continuous exposure to a wet chlorine/air mixture with maximum operating temperature of 200°F. **A certified letter of suitability for all resins must be submitted with the bids.** A corrosion barrier on the inner surface shall be a Hetron 922 vinyl ester resin measuring a minimum of 10-20 millimeters. The resin shall be composed of reinforced non-continuous glass fiber strands applied in two plies of chopped strand mat equivalent to three oz/ft. The inner resin layer shall not exceed 10% + 15% "C" glass by weight. Filament wound laminates shall have an average glass concentration of 50% - 55% by weight. Hand Layup laminates when used on the vessels and equipment shall be fabricated to meet the physical properties in accordance with PS 15-69 product standard. Press molded or compression mold flanged nozzles are acceptable up to and including 6-inch nominal size.

8. A minimum of three (3) independent media chambers shall be provided with media specific for the removal of chlorine gas. Each media chamber shall include a quick connect vacuum unloader and hinged access door.

9. Access doors and hatches shall use closed cell neoprene gasketing to prevent any air leakage.

10. Gasket material shall be 1/4" thick by 0.75" wide open cell neoprene foam.

11. Service doors and all unit access shall be oriented to suit field conditions or requirements.

12. Sample Ports - Each bed shall have one (1) 1" diameter sample port which shall extend into the bed a minimum of twelve inches. The sample probes shall be blocked off with a cap constructed of CPVC.

13. Real Time Media Life Rod monitoring system designed to operate on the bed air purification system, PureAir Electronic Media Bed Monitoring System, or Engineer approved equal.

14. The chlorine scrubber shall include an electronic media bed monitor which will measure the actual media consumption in real time. The system shall provide consumption resolution of one percent. The media consumption shall be displayed on a local NEMA 4X panel at the chlorine scrubber unit and provide a 4-20mA signal output to the SCADA system to communicate percent value of the media consumption. The monitoring system shall also have the capability to send monthly monitoring reports via SMS or wireless email which provide the following information at a minimum on a periodic basis: Unit

Identification/Location/Serial Number, Media install date, Media consumption, Predicted media depletion date.

15. Removable Lids - Each media section shall be supplied with a bulk loading access hatch. Access hatches shall be on the top of the unit and complete with quick release, snap acting type positive pressure latches with heavy weight compression gaskets. Bolted hatches are not acceptable.

16. Exhaust Stack – The system shall be provided with a straight outlet with rain cap, to prevent rain water from entering into the system. The exhaust stack is equipped with a chlorine sensor to detect chlorine gas levels in discharge air stream.

17. Scrubber housing and all components which will hold a chlorine release shall be fabricated without caulked, screwed or riveted joints, but rather seamless materials, welded construction, or gasketed joints (gasket material must be compatible with chlorine).

18. Design and fabrication of the scrubber shall take into consideration the drawings attached to the contract documents.

B. Media Containment Sections

1. Each media bed shall be contained between separate corrosion resistant support grids and perforated sheet material to provide media support while imposing a minimum resistance to air flow.

2. Each media bed section shall be equipped with media bed monitoring rod(s). The rod provides a visual indication of remaining media life.

3. The media containment section(s) shall be designed for bulk placement of new media into the unit through latched access hatches; and removal from the unit by vacuuming or manual handling, through media unload doors.

4. The media containment section(s) shall be separated to assure filling and removal of individual beds as required. Specially designed fill chutes shall allow for media settling, but shall preclude bypass of contaminated air.

C. Blower Section

1. One (1) Fan shall be provided and shall be fiberglass reinforced plastic, centrifugal type with backward inclined or radial blade, industrial fiberglass fan. Fan wheel shall be statically and dynamically balanced. Fiberglass construction shall conform to PS 15-69 product standards. Fan resin shall be suitable for exposure to the specific service conditions. Fans shall be Verantis or equal.

2. Fan housing shall be constructed of fiberglass and reinforced with rigid bracing to increase structural integrity. Bearing support brackets shall be positioned to directly oppose belt tension forces.

3. Fan housing shall be a curved scroll design with a 1" NPT drain connection at the bottom of the fan scroll. Fan outlets shall have flanged nozzles. Fan shaft shall be 316 stainless steel. Fan shall have self-aligning grease-packed bearings, with neoprene shaft seals and OSHA approved weather proof motor/drive cover. The airflow rate of the fan shall be a minimum 500 CFM at 8-inch W.C. static pressure.

4. Fan shall have a 3-Phase, 60 Hz, 230/460-Volt (Mill & CHEM duty) motor with a 1.15 service factor. Fan shall be as manufactured by Verantis or Engineer approved equal. The scrubber manufacturer shall determine the motor horsepower.

5. Provide two (2) spare V-belts.

D. Differential Pressure Instrumentation

1. A Series 2000 differential pressure gauge (0-15 Inches of Water Column IWC) as manufactured by Dwyer Instruments or Engineer approved equal shall be provided to continuously monitor the pressure drop across the media beds. The differential pressure gauge shall be mounted on the vessel and provide a local read-out of pressure drop through the media stage(s).

E. Scrubber Control and Starter Panel

1. Control panel enclosure shall be NEMA 4X rated, stainless steel, wall mounted and provided for remote (not skid) mounting. Provide master nameplate for the panel that reads "SCRUBBER CONTROL PANEL."

2. Provide main circuit breaker, thermal-magnetic with front-panel operating handle.

3. Motor starter shall be 3-pole, NEMA size 1 with electronic overload relay.

4. Provide control power transformer, 460-120 VAC, with fused primary and secondary.

5. Provide terminal blocks for all control field wiring connections.

6. Control panel shall have cover mounted operator interface and display as follows:

   a. "Hand-Off-Auto" selector switch for blower motor starter.

   b. "Reset" push button for overload relay.

   c. Push-to-test style, LED indicator lights:
      - "Control Panel Power On" (white indicator).
      - "Blower Running" (green indicator).

   d. "E-Stop" push-pull style push button to disconnect all control power to the panel.

   e. Devices shall be NEMA 4X rated, 30mm.

   f. Provide engraved legend plates for all devices. Wording shall be as shown above in quotes.

7. Panel Input/Output signals:

   a. Output contacts shall be isolated, dry contacts, rated 10A resistive.

   b. Inputs
      - "Remote start" (initiated from Chlorine Gas (leak) Detector).
      - Dry contact shall be provided from the Chlorine Ventilation System.

   c. Outputs

- "Control Panel Power On."
- "Ventilation Panel Interlock" (stop exhaust fan and close exhaust damper).
- "Scrubber in Auto."
- "Scrubber Running."
- "Scrubber Fault" (overload relay trip).

8. The control panel shall be UL 508 Labelled.

F. MEDIA

1. The ECGS system shall contain a minimum 2,350 pounds of Safetysorb media to scrub one (1) overfilled 150 lb bottle of chlorine.
2. The chlorine removing media shall be tested for conformance with the specifications and removal requirements and has been installed in at least five prior and similar applications. Test results and qualifications shall be submitted with the bids (see Section 1.5.B.4).
3. If a separate or subcontract media supplier is utilized, the submittal shall include technical qualifications for the media supplier.
4. Media shall have an alumina oxide substrate and be spherical in shape, porous, non-flammable and capable of removing chlorine throughout the entire media bed.
5. Impregnates shall be applied during pellet formation, such that the impregnate is uniformly distributed throughout the pellet volume.
6. Only media components which are compatible with chlorine shall be used. No ingredient listed on the MSDS for chlorine as incompatible shall be used including activated carbon.
7. Media shall be capable of absorbing and removing chlorine throughout the entire pellet volume and shall be totally nonflammable and shall be UL Classified, Class 1. Media with carbon in the substrate will not be acceptable.

2.12 CHLORINE ROOM VENTILATION CONTROL SYSTEM

A. General

1. The Chlorine Room Ventilation Control System shall consist of the Chlorine Room Ventilation Control Panel (see Drawing E4.2 for Elementary Diagram) located in the Lab/Office Room, control station for manual operation located outside the Chlorine Room door and a limit switch located on the Chlorine Room door.
2. The system shall control the Chlorine Room Exhaust Fan, dampers and room lighting.
3. Provide interlocking with the Chlorine Gas (leak) Detector and Emergency Gas (Chlorine) Scrubber.

B. System Function

1. The Chlorine Room Ventilation Control System shall function as follows:

a. A control station located outside of the Chlorine Room door shall allow manual operation of the room lighting and exhaust fan.

b. Automatic operation of the room lighting, and exhaust fan shall be initiated by a door mounted limit switch that will turn on the lights and exhaust fan when the door is opened. The light and exhaust fan shall be manually turned off by the operator from the control station upon leaving the room.

c. Push buttons on the control panel shall provide for remote manual operation of the room lighting and exhaust fan.

d. The Chlorine Room Ventilation Control Panel shall be interlocked with the Emergency Gas (Chlorine) Scrubber controls to start the scrubber system when initiated by the Chlorine Gas Detector.

e. The Emergency Gas (Chlorine) Scrubber controls shall be interlocked with the Chlorine Room Exhaust Fan and exhaust damper to shut off the fan and close the damper. The intake damper shall remain open while the scrubber is in operation.

f. The system shall be reset to normal off condition by pressing the off pushbutton on the Ventilation Control Panel or the door control station after the leak event is over and the scrubber system is turned off.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. The Contractor shall inspect all equipment immediately upon receipt.

B. The equipment shall not be installed, if damaged, until repairs have been made in accordance with the manufacturer's written instructions.

3.2 INSTALLATION

A. The Contractor shall install the equipment in accordance with the drawings and manufacturer's recommendations.

B. Deliver spare parts to Owner crated and tagged.

C. Start-up and Owner’s training by equipment manufacturer.

3.3 FACTORY SERVICES AND START-UP

A. System Start-Up and Training

1. The Contractor will verify in writing that the project is ready for manufacturer’s field services. Copies of written verification shall be given to the manufacturer, Engineer and Owner prior to scheduling field services.

2. The Contractor shall provide the services of a factory representative during start-up of the chlorination system. The Contractor shall provide a minimum of four (4) days on site for start-up, calibration and training. The four (4) days on site include one half day for start-up and functional testing of the chlorine booster pump, one half day for the start-up and functional testing of the gas chlorination equipment, one day for operator training of the gas chlorination equipment, and two consecutive days for start-up and functional testing of the gas chlorine scrubber equipment. At a

minimum, the equipment manufacturer's technician shall perform the following start-up functions:

a. Inspect the final installation to assure proper installation, connection and wiring of all equipment of the manufacturer's supply.

b. Start-up of the equipment in the presence of the Contractor, Engineer and Owner's operating personnel.

c. Training of Owner's operating personnel in proper operation and maintenance procedures, start-up/shutdown procedures, response to emergency conditions, and troubleshooting. The responsibility of the Contractor and the factory service representative with regard to start-up shall be fulfilled when the start-up is complete, the equipment is functioning properly, operating personnel have been trained and the equipment has been accepted by the Owner.

d. Upon completion of the installation and as part of the manufacturer's field services, a total of 2 consecutive days (8-hour days) shall be provided to instruct the owner's staff on system operation, maintenance, and media sampling of scrubber system.

e. Field performance tests shall be conducted by the gas scrubber manufacturer and performed for 4 hours. The gas scrubber shall be tested for compliance with the specifications to demonstrate that all components function properly, and that the unit produces the required airflow rate. The gas scrubber system will be tested using the automatic method of control. All control work shall be completed prior to the field tests. The field tests will not require leaking of chlorine, except to activate the gas detectors. Field testing shall include measurement of at least airflow rate from the chemical storage room and pressure drop through the scrubber.

3.4 ANALYTICAL SERVICES AND MEDIA REPLACEMENT

1. The manufacturer shall, after start-up, provide a service, free of charge to the Owner, to instruct the owner in media sampling; and shall provide appropriate lab analysis to determine the remaining life cycle of the media.

2. Such service shall be provided at the manufacturer's expense for a period of ten years.

3. If authorized, the manufacturer shall provide a media replacement warranty valid for 10 years from the date of start-up of the unit. The warranty shall provide replacement of the media in the event that more than 50% of the media in the scrubber is consumed. The manufacturer shall furnish replacement media as required to reinstate the scrubber to its designed full capacity. The Owner shall be required to provide media samples for testing to the manufacturer at a minimum of once a year.

END OF SECTION 46 31 11

DIVISION 46 - WATER AND WASTEWATER EQIUPMENT
SECTION 46 33 00 – LIQUID CHEMICAL FEED EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the contract including, but not limited to, General Conditions, Supplementary Conditions and Division 01 Specification Sections apply to this section.

B. Related sections to this specification, include but may not be limited to, the following:

1. Section 01 11 00 – Summary of Work
2. Section 01 33 23 – Shop Drawing, Product Data and Samples
3. Section 26 05 00 – Common Work Results for Electrical
4. Section 40 90 00 – Control System
5. Section 40 90 20 – Instrumentation

1.2 SUMMARY

A. Furnish and install the feed pumps, tubings, and all other accessories and related appurtenances to feed hydrofluorosilicic acid (fluoride) and Polyphosphate (fed as liquid) to the application points as shown on the drawings. A Total of two (2) complete chemical injection assemblies/system of the same type shall be provided.

B. Chemical feeding system shall be provided for the following:

1. Fluoride (fed as 26% hydrofluorosilicic acid by wt) for dental health

2. Phosphate (fed as liquid) for corrosion control

1.3 QUALITY ASSURANCE

A. The equipment and materials to be furnished under this Contract shall be free from defects. The complete fluoride feed system and polyphosphate system, each shall be furnished by a single manufacturer having complete system responsibility for the operation of the system.

B. The chemical feed equipment shall conform to the applicable AWWA Standards and ANSI/NSF Standard 60.

1.4 REFERENCE STANDARDS

A. The work in this section is subject to the requirements of applicable portions of the following standards:

1. Ten States Standards
2. Illinois EPA Design Standards
3. NSF Regulations
4. OSHA Rules and Regulations

1.5 SUBMITTALS

A. Shop drawings and manufacturers literature demonstrating compliance with this specification.

B. Operation and Maintenance Manuals: Complete with manufacturer's instructions for equipment installation, equipment function, start-up procedures, operation, preventative maintenance, servicing and troubleshooting. Submittals shall be in accordance with Section 01 32 16.

1.6 DELIVERY, STORAGE AND HANDLING

A. The Contractor shall be responsible for the delivery, storage and handling of products in accordance with the manufacturer's recommendations.

1.7 WARRANTY REQUIREMENTS

A. The pumps shall be warranted by the manufacturer for a period of three years.

1.8 SUPERVISION

A. The Contractor shall arrange for the equipment manufacturer to provide a qualified field representative as required for the purpose of checking installation, start-up, final field acceptance testing, and providing instruction to the Owner's operating personnel in the proper operation and maintenance of the equipment in this section.

1.8 ACCEPTABLE MANUFACTURERS

A. FLEXFLO M-Series Peristaltic Metering Pump, Model M1, Manufactured in the U.S.A. by Blue-White Industries, C.O Peterson & Matz, (847) 844 – 4405.

B. Or equal.

PART 2 PRODUCTS

2.1 MATERIALS/CONSTRUCTION

A. Metering Pump Shall be a positive displacement, peristaltic type tubing pump with a brushless variable speed motor, non-spring-loaded roller assembly located in the pump head, integral tube failure detection system, and flexible tubing with attached connection fittings. FLEXFLO M1 model shall be capable of output volumes from 0.0001 to 5.60 gallons per hour.

B. There shall be no valves, diaphragms, springs, or dynamic seals in the fluid path. Process fluid shall contact the pump tubing assembly and connection fittings only.

C. Pump shall be capable of 24-hour continuous duty and self-priming at the rated maximum pressure of up to 100 PSI (6.89 bar).

D. Pump shall be capable of running dry without damage.

E. Suction lift shall be 30 feet (9.14 m) of water.

F. Pump shall be warranted by the manufacturer for a period of three years. Warranty shall include chemical damage to the pump head and roller assembly for a period of two years.

2.2 PUMPHEAD

A. Pump head Shall be a single, unbroken track with a clear removable cover.

B. Tube failure detection sensors shall be wholly located in the pump head. Tube failure detection system shall trigger when liquid makes contact. Float type switches shall not be used. Process fluid waste ports or leak drains shall not be provided.

C. Squeeze rollers with encapsulated bronze sleeve bearings shall be directly coupled to a two-piece thermoplastic rotor. Three Nylon rollers shall be provided and shall be located 120 degrees apart. The roller diameters and occlusion gap shall be factory set to provide the optimum tubing compression; field adjustment shall not be required. Spring-loaded or hinged rollers shall not be used.

D. Rotor assembly shall be installed on a D-shaped, chrome plated motor shaft and removable without tools.

E. For tubing installation and removal, rotor assembly shall be rotated by the motor drive. Hand cranking of the rotor assembly shall not be required.

F. Pump head and tubing compression surface shall be corrosion resistant Valox thermoplastic.

G. The pump head cover shall be clear, acrylic thermoplastic with a bronze sleeve bearing fitted to support the overhung load on the motor shaft.

H. Cover shall be positively secured to the pump head using a minimum of three thumb screws. Tools shall not be required to remove the pump head cover.

2.3 PUMP TUBE ASSEMBLY

A. To ensure pump performance and accuracy, only tubing provided by the manufacturer is acceptable.

B. Pump tube shall be assembled to connection fittings of PVDF material.

C. Connection fittings shall be permanently clamped to the tubing with stainless steel clamps. To prevent tubing misalignment and ensure accuracy, fittings shall insert into keyed slots located in the pump head and secured in place by the pump head cover.

D. Connection fittings shall be 1/2” M/NPT or fittings shall accept 1/4” ID x 3/8” OD flexible tubing.

E. Tube sizes and connections shall be measured in inches.

F. The following tube sizes shall be available:

Tube Model	Feed Rate (GPH)	Feed Rate (LPH)	Maximum Pressure PSI (bar)	Maximum Temperature °F (°C)
A1-1*	0.0001 - 1.09	0.0004 - 4.13	65 (4.50)	130 (54)
A1-3*	0.0006 - 5.60	0.0021 - 21.2	50 (3.45)	130 (54)
A1-6*	0.0001 - 1.35	0.0005 - 5.14	100 (6.89)	185 (85)
A1-7*	0.0004 - 4.17	0.0016 - 15.8	50 (3.45)	185 (85)
A1-8*	0.0003 - 3.09	0.0012 - 11.7	50 (3.45)	130 (54)

Note: *Data pertains to both “T” and “M” connection types.

2.4 DRIVE SYSTEM

A. Drive System Shall be factory installed and totally enclosed in a NEMA 4X, (IP66) wash-down enclosure. Capable of operating on any input power from 110VAC to 240VAC, 50/60 Hz single phase supply without user configuration or selection switches.

a. Motor

i. Brushless DC gear motor rated for continuous duty.

ii. Motor shall include overload protection.

iii. The maximum gear motor RPM shall be 65 RPM.

b. Control Circuitry

i. All control circuitries shall be integral to the pump.

ii. All control circuitries shall be integral to the pump and capable of adjusting the pump motor speed from 0.01% to 100.0% in 0.01% increments less than 1% motor speed, in 0.01% increments between 1% and 10% motor speed, and in 0.1% increments greater than 10% motor speed (10,000:1 turndown ratio).

iii. The pump output shall be capable of being manually controlled via front panel user touchpad controls. The pump motor speed shall be adjustable from 0.01% to 100.0% in 0.01% increments less than 1% motor speed, in 0.01% increments between 1% and 10% motor speed, and in 0.1% increments greater than 10% motor speed.

iv. The pump shall be capable of being remotely controlled via 4-20mA analog input. The input resolution shall be 0.01 of input value and capable of adjusting the pump motor speed from 0% to 100.0% motor speed in 0.1% increments. Four values shall be user configurable to define the low and high points on the output slope: a low input value, the required pump

percentage of motor speed at the low input value, a high input value, the required pump percentage of motor speed at the high input value.

v. Provide an 8-button front panel user touchpad control for stop/start, FVS, lockout key, display reading, operating mode selection, remote start/stop activation, and priming.

vi. Provide a single color 7 segment LCD display for menu driven configuration settings, pump output value, tube failure detection (TFD) system, flow verification system (FVS), and remote input signal values.

vii. Provide for remote stop/start pump via a non-powered contact closure loop.

viii. Provide one solid state relay and one contact closure relay. Solid state relay shall trigger when motor is active. Contact closure relay shall trigger with any of the following pump functions: TFD system, FVS system, motor run/stop, and any pump error code.

ix. Provide a lock-out button that shall disable use of manual adjust up and down buttons

x. Provide a flow verification system with programmable alarm delay time from 1-20 seconds. FVS system shall monitor the FVS flow sensor while pump is running only. System shall not monitor pump while not running.

2.5 FLOW VERIFICATION SENSOR

A. Flow Verification Sensor shall output high-speed digital pulse signal or 4-20 mA, while pump is running only, to verify chemical injection.

B. Flow verification sensor shall be an ultrasonic transit time sensor.

C. Wetted components shall be PVDF (optional PVC), PEEK, and TFE/P (optional EP).

D. End fittings shall be PVDF with optional PVC slip fittings. All are included.

E. Sensor operating range shall be as follows:

Code	Flow Range (GPH)	Flow Range (LPH)	Flow Range (mL/min)
A	0.158-79.2	0.597-299.4	10.0-5,000

F. Shall provide a scalable 4-20 mA sourcing output.

G. Shall provide a scalable 0-10,000 Hz open collector frequency output

H. Shall provide a programmable Form C Solid State Relay rated for a maximum load capacity of 24 VDC and 100 mA.

I. Programmable for high/low flow rate alarm.

J. Programmable to energize on specified flow total.

K. Power Requirements: 5 VDC; 5 Watts maximum.

L. Shall be certified to NSF Standard 61 Drinking Water System Components.

M. Accuracy shall be +/- 0.75% full scale. Accuracy shall be +/- 0.25% at the field calibrated setpoint.

2.6 SAFETY

A. The pump shall be certified to NSF Standard 61 Drinking Water System Components, UL standard 778 motor operated pump and CSA standard C22.2 process control equipment.

B. Manufactured to ISO 9001:2015 requirements and processes.

C. Tube Failure Detection (TFD+) system sensors shall be wholly located in the pump head. TFD+ system will stop the pump within three seconds of leak detection. Process fluid waste ports or leak drains shall not be provided.

2.7 CHEMICAL STORAGE BULK TANK

A. Provide two (2), 625-gallon double-walled bulk storage tank for bulk storage of fluoride and phosphates at the location shown on the plans.
   a. Each individual tank shall not be greater than 47-inches in diameter and shall not be greater than 113-inches in height.
   b. Acceptable manufacturer: Double Wall Storage Tank by Assmann Corporation of America, Model: IMT-625, C.O Peterson & Matz, (847) 844 – 4405, or equal.

2.8 CHEMICAL DAY TANK

A. Provide a total of two (2), 20-gallon day storage tank for fluoride and phosphate chemicals as shown on the plans
   a. Each individual tank shall have an outside diameter no greater than 27-inches and shall not be greater than 22-inches in height.
   b. Acceptable manufacturer: Double Wall Storage Tank by Assmann Corporation of America, Model: IMT-20, C.O Peterson & Matz, (847) 844 – 4405, or equal.
   c. The bulk tank and the day tank shall be connected using a 2-inch pipe and a control valve as shown on the plans.
   d. The day tanks shall sit on a battery powered digital weight indicator
      i. The scale shall not require any power to operate
      ii. The digital scale shall be able to take 4-20 mA signal back to the plant SCADA system for remote monitoring

iii. The scale local indicator shall not sit directly above the day tank or the vent pipe from the day tank.

iv. Acceptable manufacture:

1. Force Flow SOLO XT C.O Peterson & Matz, (847) 844 – 4405, or equal.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. The Contractor shall inspect all equipment immediately upon receipt.

B. The equipment shall not be installed, if damaged, until repairs have been made in accordance with the manufacturer's written instructions.

3.2 INSTALLATION

A. The Contractor shall install the equipment in accordance with the drawings and the manufacturer's recommendations.

B. A vent pipe shall be installed as shown on the plans from the shipping drum locations to the outside of the building to be 6-inches below the roof soffit level with a corrosion resistant #24 mesh screen.

3.3 FACTORY SERVICES AND START-UP

A. System Start-Up and Training

1. The Contractor will verify in writing that the project is ready for manufacturer’s field services. Copies of written verification shall be given to the manufacturer, Engineer and Owner prior to scheduling field services.

2. The Contractor shall provide the services of a factory representative during start-up of the chemical feed systems. The Contractor shall provide a minimum of one (1) day on site for start-up, calibration and training. At a minimum, the equipment manufacturer’s technician shall perform the following start-up functions:

a. Inspect the final installation to assure proper installation, connection and wiring of all equipment of the manufacturer’s supply.

b. Start-up of the equipment in the presence of the Contractor, Engineer and Owner’s operating personnel.

c. Training of Owner’s operating personnel in proper operation and maintenance procedures, start-up/shutdown procedures, response to emergency conditions, and troubleshooting. The responsibility of the Contractor and the factory service representative with regard to start-up shall be fulfilled when the start-up is complete, the equipment is functioning properly, operating personnel have been trained and the equipment has been accepted by the Owner.

END OF SECTION 46 33 00

DIVISION 46 – WATER AND WASTEWATER EQUIPMENT
SECTION 46 61 00 – FILTRATION UNITS

PART 1 – GENERAL

1.1 SCOPE

A. Furnish and install two (2) dual cell, gravity flow dual media filters, (4) cells total for final filtration at the locations shown on the plan drawings.

B. The General Contractor shall supply and install the Filter foundations, backwash pumps, piping, valves, instruments, control panels and any other work not directly specified in this Section required to complete the installation.

1.2 APPLICABLE STANDARDS

A. Steel shell: AWWA D-100
B. Structural components: Latest edition AISC
C. Steel Plate: A283C or A36
D. Filter media: AWWA B100 - Latest edition
E. Welders and welding procedures: AWS certification AWWA D-100
F. American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Welding and Brazing Qualifications: ASME IX
G. American Society for Testing and Materials: ASTM
H. American Welding Society, Structural Welding Code, Steel: AWS D1.1
I. American Water Works Association, Filtering Material: AWWA B100
J. American Water Works Association, Standard for Welded Tanks for Water Storage: AWWA D100
K. Occupational Safety and Health Administration: OSHA
L. Steel Structures Painting Council, Paint Application Specification: SSPC-PA1
M. Units must be IEPA approved
N. Ten State Standards

1.3 RELATED SECTIONS

A. Related sections in this specification include but may not be limited to the following.

1. Section 01 11 00 – Summary of Work
2. Section 01 33 23 – Shop Drawings, Product Data and Samples
3. Section 09 96 56 – Steel Tank Painting
4. Section 40 23 19 – Process Piping and Accessories
5. Section 40 92 13 – Process Valves and Accessories

1.4 SUBMITTALS

A. Equipment shop drawings shall be approved prior to fabrications.

B. Provide certification by a Professional Engineer and Structural Engineer licensed in Illinois that equipment design meets applicable codes.

C. Operation and Maintenance Manuals: Complete with manufacturer’s instructions for

equipment installation, equipment function, start-up procedures, operation, preventative maintenance, servicing and troubleshooting. Submittals shall be in accordance with Section 01 32 16.

1.5 SUPPLIER PRE-QUALIFICATION

A. To ensure proper design, satisfactory performance, quality fabrication and construction, the Filter Supplier shall satisfy the following standards and experience requirements as evidenced by submittal to the Engineer prior to submitting bids for this Section:

1. The Filters shall be designed, furnished and erected by a single Filter Supplier without subcontracting any portion of the work to outside parties.

2. The Filter Supplier shall have designed, fabricated and constructed at least ten (10) similar filters with the techniques and tolerances found in Section 3.4 with its own employees (not subcontractors with supervision).

3. Filter Supplier erection personnel shall have significant prior experience in the Boiler Maker Trade.

4. Filter Supplier field supervision shall have at least fifteen (15) years of experience in the fabrication and erection of welded conical or double-curvature steel plate structures.

5. All Filter Supplier shop and field welders shall be certified to ASME Section IX or AWS Section D1.1 requirements.

6. With regards to the erection crew, evidence of experience to safely erect the work must be demonstrated by a Filter Supplier’s Experience Modification Rate (EMR) of less than 0.5.

7. The Filter Supplier shall submit a list of at least ten (10) Filters that have been operated continuously in a satisfactory manner for at least two (2) years on waters with similar characteristics and treatment chemistry to this treatment application.

8. The Filter Supplier shall certify by written submittal that it will bid the work inclusive of any patent licensing costs and in complete accordance with this Specification Section. If any exceptions or clarifications are taken, they shall be described in detail in the pre-qualification submittal with reference to the appropriate Specification part.

1.6 WARRANTY REQUIREMENTS

A. All equipment, unless otherwise stated, shall be warranted by the manufacturer for 12 months from date of start-up not to exceed 18 months from date of shipment.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Decelerating-Flow Gravity Filters as manufactured by CBI, C/O. Aquaflo Technologies, Inc. (618) 664-4469, or equal.

2.2 GENERAL

A. Furnish and erect two (2) Filters as shown on the Plans and as specified herein. Each Filter shall be subdivided into Two (2) cells with partitions.

B. The Filters shall be designed to operate on the constant rate-variable head principle wherein loss of head shall be determined by observation of the water level above the static media elevation.

2.3 DESIGN CRITERIA

A. Each filter shall be designed for the following operating conditions:

Minimum Flow (gpm)	600
Average Design Flow (gpm)	900
Maximum Flow (gpm)	1200
Filtration Rate – At Underdrain (gpm/ft^2) all filter cells in service	3
Filtration Rate – At Underdrain (gpm/ft^2) one filter cell out of service	4

B. Each Filter shall be constructed to the following major dimensions:

Bottom Width - Inside (feet)	11’-0”
Underdrain Plate Width - Inside (feet)	10’-0”
Top Width – Inside (feet)	5’-4”
Total Length – Inside (feet)	30’-0’
Cell Length – Inside (feet)	15’-0”
Total Underdrain Area (ft^2)	300
Cell Underdrain Area (ft^2)	150
Underdrain Chamber Height (feet)	2’-0”
Overall Height (feet)	12’-0”

C. The shell shall be designed using the allowable stresses specified in accordance with the latest edition of AWWA D100. All other structural components shall be designed in accordance with the latest edition of AISC.

D. All external piping must be supported independently of the vessel to prevent the transfer of piping dead and live loads to the vessel shell or nozzles.

E. Unless otherwise specified, the Filter shall be fabricated from ASTM A36 steel plate and A36 structural steel. Certain miscellaneous components shall be furnished in other materials as specified herein.

F. No corrosion allowance is required.

G. The minimum thickness of the shell pressure boundary shall be 1/4” except for the underdrain and bottom plates, which shall be 3/8”.

H. The minimum thickness of all internals, weir troughs, bridge structural and other components shall be 3/16”.

2.4 COMPONENTS

2.4.1 SHELL

A. The Filter shall be rectangular in plan, constructed with sloped longitudinal walls to provide higher loading rates at the media surface than at the underdrain, permitting greater utilization of the media depth.

B. The Filter end walls shall be vertical. The filtered water velocity shall decrease as it flows downward through the filter media, reducing the probability of particle breakthrough.

C. During backwash, the washwater velocity shall increase as it flows upward through the filter media, maximizing the backwash rate and bed expansion at the media surface, where the greatest portion of filtered particles are concentrated. The Filter dimensions and the weir to underdrain area ratio shall be as shown on the submittals.

D. The Filter shall be open top and shall be of all-welded construction. An underdrain plate shall be positioned near the bottom of the walls for collection of filtered water or distribution of backwash water.

E. The filter shall be stiffened on the sloped and vertical walls to resist all loading conditions. The stiffening shall extend from the bottom plate to a continuous top angle. Stiffening spacing on the longitudinal walls shall not exceed 2’-6” in plan. No stiffening will be allowed on the shell or topside of the underdrain plates that are in contact with the media.

2.4.2 PARTITIONS

A. Each Filter vessel shall be subdivided into multiple filtration cells by the use of internal, vertical partition plate(s).

B. The partition plates shall be designed to permit an individual cell to be taken out of service while any adjacent cell remains in service. The partition plates shall therefore be stiffened to resist the maximum possible water differential between cells. Partition stiffening only shall be permitted in the filter media contact zone.

2.4.3 BOTTOM PLATE

A. The Filter bottom shall consist of a continuous, flat plate with anchor chairs. The Filter bottom

shall be designed for installation over a flat concrete foundation constructed without sumps, flumes or other non-uniform profiles.

B. The general contractor shall be responsible for the construction of the foundation.

2.4.4 UNDERDRAIN SYSTEM

A. The underdrain shall consist of a steel filter plate fitted with filter distribution nozzles and a filtered water collection or underdrain chamber that is 2'-0" in height. The underdrain shall be designed to uniformly collect water during the filtration mode, to retain the filter media and to uniformly distribute water or an air/water mixture, during the backwash mode.

B. The filter underdrain nozzles shall be orthos Liquid Systems Model D-24x0.2-M24-45-80-ø12.4-PP. Each nozzle shall be installed into the underdrain plate floor into 1-1/8" diameter holes, including paint thickness, using an Orthos Liquid Systems Model type DB50.28.PP expanding ring. A gasket made of NSF-61 certified Santoprene material shall also be utilized per nozzle. Each filter underdrain nozzle and expanding ring shall be molded of NSF-certified polypropylene. The nozzle screen shall be supported by a minimum of one reinforcing rib perpendicular to slot length to minimize deflection in either flow direction. Nozzle slots shall be vertical and suitably sized for compatibility with the filter media and designed to prevent clogging from small particles. Nozzles shall have an 80mm stem to ensure effective pressure drop through the nozzle without relying solely on its screen. Nozzles shall be easily installed (screwed into) and removed from the top side of the underdrain and shall not require epoxy or metal fasteners for installation.

C. The filter plate shall be fabricated from a minimum of 3/8" thick steel plate, reinforced to withstand a maximum differential pressure, across the filter plate during backwash, of 20 feet of water column. Reinforcement or stiffening shall weld to the underside of the underdrain plate. The filter plate shall be drilled to receive filter distribution nozzles.

D. Pipe manifold and lateral underdrain systems will not be allowed.

2.4.5 UNDERDRAIN VENT

A. The closed underdrain or collection chamber shall be vented with an external pipe with its discharge directed back towards the open, top surface of the Filter.

B. Vent nozzle, pipe and supports shall be supplied by the Filter Supplier. The vent pipe shall be fabricated of either ¼" wall carbon steel pipe or Schedule 80 PVC and also provided with a stainless-steel screen over the end of the pipe.

2.4.6 UNDERDRAIN DISTRIBUTION NOZZLES

A. The filter nozzles shall be designed for combination filtered water collection and backwash water only distribution.

B. The nozzles shall be located on 6" centers and shall have multiple vertical tapered apertures sized to effectively retain the filter media during the filtering and backwash process, without the use of support gravel.

C. The nozzle area shall be approximately 0.003 the filter area to accurately and equally distribute backwash water. Each nozzle shall be easily removed (by unscrewing) from the top side of the filter plate, back-up nuts, couplings and filter plate threading methods are not acceptable.

D. The filter nozzles shall be fabricated of virgin polypropylene and NSF 61 approved. Evidence of NSF certification must be furnished.

E. The filter nozzle shall consist of a vertically slotted nozzle cap, threaded body, expanding ring and gasket. The nozzle component assembly shall not require gluing, heat welding or metal screws for assembly but shall consist of a mechanically locked assembly.

F. The slotted nozzle cap shall have V shaped slots for self-cleaning. The slots shall extend to the underdrain plate gasket to ensure drain down. The slots shall be supported by external rings spaced at a maximum of ½" to provide internal strength during backwash.

G. The nozzle body shall be threaded for assembly to the threaded expanding retainer ring. The nozzle shall be designed for the following conditions:

Filtration:	1.25 gpm/nozzle
Water Backwash:	5 gpm/nozzle

H. The distribution nozzles shall be assembled to the steel underdrain plate by expanding retainer rings that can be tapped through the un-threaded underdrain plate. Threading the nozzle body through the retainer ring shall expand the ring below the underdrain plate to retain the nozzle assembly in place.

I. The General Contractor shall install the filter distribution nozzles in accordance with the Filter Suppliers' instructions after performing underdrain flushing and cleaning. The General Contractor shall test the underdrain system, in the filtration mode and in the backwash mode, to verify proper nozzle installation prior to installing the media.

2.4.7 ROTARY WASHERS

A. The Filter Supplier shall furnish rotary surface washers to scour the media surface during media backwash operations. The rotary surface washer s shall operate during the backwash cycle to scour the filter media and remove particles adhering to the media.

B. The rotary surface washer shall consist of a bronze or delrin rotary joint, a bronze or delrin tee, two red brass pipe laterals with nozzles and rotation indicator with watertight fitting. The nozzles shall be spaced on the laterals so as to effectively cover the surface of the bed. The rotation indicator shall be rigidly connected to the tee below the rotary joint, shall have a vertical shaft extending through a threaded coupling provided by the Filter Supplier in the inlet-backwash distribution through and shall exit the piping through a watertight fitting provided by the surface washer manufacturer.

C. The General Contractor shall install the rotary surface washer and all connecting piping, valves and controls.

2.4.8 DISTRIBUTION TROUGH

A. The inlet water shall be distributed over the media surface and the backwash water will be collected by a fabricated inlet distribution/washwater collection trough that is welded on the centerline of each cells' longitudinal axis. The bottom of the trough shall be V shaped.

B. The trough shall be supported by hangers extending to a support member located at the top of the Filter. The trough shall be positioned to provide sufficient backwash freeboard.

C. An adjustable sharp edged weir plate shall be mounted directly to the upper portion of the trough. The inlet/washwater outlet nozzle shall be connected to the trough by internal piping.

D. The General Contractor shall install and level the adjustable weir plates, so they are level from Filter to Filter to ensure uniform inlet flow splitting.

2.4.9 FILTER MEDIA

The Filter Supplier shall furnish filter media in accordance with the provisions of AWWA Specification B100 and as specified herein. Filter media shall consist of a layer of greensand plus and a layer of anthracite. Clean the filter tanks before any media is placed and keep them clean throughout the placing operation.

Greensand Plus

The bottom layer of filter media shall consist of 24-inches of GreensandPlus™ as manufactured by Inversand Company. The silica sand core GreensandPlus media shall be capable of acting as a catalyst in the oxidation and reduction of soluble iron and manganese from raw water and be capable of removal of the said oxides. The GreensandPlus filter media shall also be capable of removing hydrogen Sulfide, arsenic, and radium from groundwater supplies. The GreensandPlus shall have the following physical characteristics and design parameters:

Physical Form	Black, nodular granules shipped in a dry form
Apparent Density	88 pounds per cubic foot net (1410.26 kg/m3)
Shipping Weight	90 pounds per cubic foot gross (1442.31 kg/m3)
Specific Gravity	Approximately 2.4
Porosity	Approximately 0.45
Screen Grading (dry)	18 X 60 mesh
Effective Size	0.30 to 0.35 mm
Uniformity Coefficient	Less than 1.60
pH Range	6.2-8.5 (see General Notes)
Maximum Temperature	No limit

Backwash Rate	Minimum 12 gpm/sq. ft. at 55°F (29.4 m/hr @ 12.78°C)
Service Flow Rate	2 - 12 gpm/sq. ft (4.9m/hr - 29.4 m/hr)
Minimum Bed Depth	24 inches (610 mm) of GreensandPlus alone.

Catalytic Oxidation (CO) operation is recommended in applications where iron removal is the main objective in well waters with or without the presence of manganese. This method involves the feeding of a predetermined amount of chlorine (CI_2) or other strong oxidant directly to the raw water before the GreensandPlus Filter.

The GreensandPlus media shall be backwashed prior to adding the anthracite cap. The minimum backwash rate shall be 12 gpm/sq. ft. at an ambient water temperature of 55°F.

Post backwashing, the GreensandPlus media shall be conditioned by a mixture consisting of 0.5 gal. (1.9L) of 6% household bleach or 0.2 gal (0.75L) of 12% sodium hypochlorite, combined with 6.5 gallons (25 L) of water, for every 1 cu. Ft (28.3 L cu. m) of GreensandPlus. The filter shall be drained before the addition of diluted chlorine mix. Diluted chlorine shall be applied to the filter and given a minimum contact time of 4 hours. After ample contact time has been provided, the filter media shall be washed until the free chlorine residual is less than 0.2 mg/L in the waste water.

Filter Anthracite

Filter anthracite shall be composed of graded hard, durable anthracite coal particles and shall conform in all respects to the physical requirements specified in the latest edition of the AWWA Standard B100. The anthracite shall have an effective size of 0.95 - 1.05 mm as shown below.

Apparent Specific Gravity	1.65
Hardness (MOH Scale)	3.0 - 3.8
Attrition Losses	Minimal
Surface Factor (Loosely packed)	0.61
Surface Factor (Tightly packed)	0.60
Acid Solubility (per AWWA)	1%
Caustic Solubility (1% NaOH at 190°F)	1%
Uniformity Coefficient	1.5

US Sieve Size	Percent Passing
10	92.0
12	79.8
14	56.2
16	24.5
18	8.0
20	2.3

Average ultimate analyses (moisture and ash-free basis)

Hydrogen	2.1%
Carbon	84.7%
Nitrogen	0.8%
Oxygen	1.6%
Sulphur	0.8%
B.T.U.	14,828

Each Filter shall be provided initially with sufficient anthracite coal to allow a total of one (1) inch of surface skimming. After the anthracite has been placed, the Filter shall be backwashed, and the top one inch of anthracite shall be skimmed from the surface and discarded. This operation shall be performed one (1) time in order to remove fine particles in the anthracite.

The final anthracite bed depth shall be 12".

Filter Media Installation

1. The filter media shall be installed and skimmed by the General Contractor in accordance with the Filter Supplier's instructions.
2. Filter media shall be installed only after the filter distribution nozzles have been tested with flow. Filter media may be installed with water in Filters to facilitate spreading of the media.
3. Extreme care shall be exercised in the placement of all filter media to avoid damage to the filter distribution nozzles or displacement of previously placed media. When placing, classifying and skimming the media, walking directly on the media support surface, nozzles or media will not be permitted. To perform these functions, the General Contractor shall provide and place a working platform in the Filter. The platform shall be arranged to prevent crushing of the media support surface, nozzles and media.

2.4.10 NOZZLES

The Filter Supplier shall furnish the following nozzles for each cell in the filter with flanged nozzles extending 12 inches beyond the shell or plate surface. Flanges for nozzles that will be connected to external piping shall be left loose for final alignment and welding in place by the General Contractor.

Description	Number	Dia. (inches)	Type
Inlet/Backwash Outlet	1		Flanged
Outlet/Backwash Supply	1		Flanged
Underdrain Vent	1	2	Flanged
Drain	1	3	Flanged
Sluicing	1	2	Screwed
Manway	1	20	Flanged
Overflow	1		Flanged

2.4.11 ANCHORAGE

A. Anchor chairs shall be positioned around the Filter bottom and welded into the vertical side wall stiffening.

B. The Filter Supplier shall furnish, 316 stainless steel anchor bolts, nuts and washers.

C. The General Contractor shall install the anchor bolts in the concrete foundation in accordance with the Filter Suppliers' instructions.

2.4.12 FASTENERS

A. The Filter Supplier shall furnish all permanent fasteners of 304 stainless steel.

2.4.13 LEVEL CONTROL LOOP

A. The General Contractor shall furnish and install level control loops in the filtered water piping as shown on the Plans or as instructed by the Filter Supplier to maintain a minimum water level above the filter media.

2.4.14 STAFF GAUGE

A. Provide a carbon steel staff gauge inside the media filters for liquid level measurement. The depths on the staff gauge shall be engraved.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install according to Manufacturer's instructions and Plan drawings.

B. Only for larger vessels that require field welding, field inspection of butt welds shall be performed by the Filter Supplier by spot radiography in accordance with the latest edition of AWWA D100. All radiographs shall become the property of the Owner. Inspection of shell butt welds, by sectioning (cutting plugs), oil testing or vacuum testing, will not be permitted.

3.2 FABRICATION AND ERECTION

A. Equipment supplier shall fabricate and erect equipment with its own forces. Field erection crews shall have demonstrable experience erecting the equipment to be provided. Erection by subcontractors having no previous experience erecting the equipment shall not be allowed. Welding procedures and welders certified per applicable standards this specification.

B. For field erection, welding inspection of butt welds shall be required per AWWA D-100 by spot radiography at Contractor's expense with radiographs submitted to the Engineer. Radiographic inspection shall not be required for shop fabrication.

C. Misalignment of butt joints shall not exceed 1/16 inch. Back-up bars are not permitted in butt joints.

D. Fabrication and field banding and peaking shall not exceed 1/2 inch in any 36-inch long arc when measured with a 36 inch long sweep boards.

E. All weld spatter, burrs and slag shall be removed by chipping, grinding or brushing.

F. All external piping must be supported independently of the vessel to prevent the transfer of piping dead and live loads to the vessel nozzles or shell. All external piping, valves, and supports beyond the first vessel flange are by the general contractor.

3.3 SAND CUSHION

A. A sand cushion shall be furnished and installed under the Filter lower cylinder to provide for uniformity of bearing between the plate bottom and the foundation and as an insulator against galvanic corrosion. Cushion thickness shall be a minimum of 1 inch over flat concrete slabs. The outer circumference of the bottom plate shall be grouted full with either a non-shrink grout or a 1:1.5 cement-sand grout to contain the sand. See AWWA D100, Section 12.6, notes 1, 2 and 3.

B. Alternatively, the bottom plate may be fully grouted under its entire surface with a non-shrink grout, a pumpable grout or a 1:1.5 cement-sand grout.

C. The General Contractor shall furnish and install the sand cushion in compliance with this Specification and with the Plans which may specify sand and grout thicknesses in excess of the minimum

3.4 FOUNDATION

A. Construct according to the plan drawings and the specifications. Supplier shall furnish anchor bolts, nuts and washers.

B. The poured concrete foundation shall be level to within □1/4 inch within the total circumference of the foundation.

3.5 PAINTING

A. Interior and exterior painting per Specification Section 09 96 56

3.6 DISINFECTION

A. Contractor shall satisfactorily disinfect the filtration units prior to start-up complying with 35 ILL. Adm. Code 652.203.

3.7 STARTUP SERVICE/CERTIFICATION

A. Check out by manufacturer upon completion.

B. Manufacturer shall certify to the Engineer that the units have been fabricated and installed in accordance with instructions/requirements.

C. After certification and acceptance by OWNER, Manufacturer shall provide process engineer for up to four (4) days in two (2) site visits for startup and training OWNER's operators.

END OF SECTION 46 61 00

DIVISION 46 – WATER AND WASTEWATER EQUIPMENT
SECTION 46 61 01 – ACTIVATED CARBON MEDIA GRAVITY FILTERS

PART 1 – GENERAL

1.1 SCOPE

A. Furnish and install **Four (4)** dual-cell, Activated Carbon Media, Gravity Filters at the locations shown on the plan drawings. The filters are designed to remove PFAS from the finished water produced at the plant.

B. The General Contractor shall supply and install the Filter foundations, backwash pumps, piping, valves, instruments, control panels and any other work not directly specified in this Section required to complete the installation.

1.2 APPLICABLE STANDARDS

A. Steel shell: AWWA D-100
B. Structural components: Latest edition AISC
C. Steel Plate: A283C or A36
D. Filter media: ANSI/AWWA B604 - Latest edition
E. Welders and welding procedures: AWS certification AWWA D-100
F. American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Welding and Brazing Qualifications: ASME IX
G. American Society for Testing and Materials: ASTM
H. American Welding Society, Structural Welding Code, Steel: AWS D1.1
I. American Water Works Association, Filtering Material: AWWA B604
J. American Water Works Association, Standard for Welded Tanks for Water Storage: AWWA D100
K. Occupational Safety and Health Administration: OSHA
L. Steel Structures Painting Council, Paint Application Specification: SSPC-PA1
M. Units must be IEPA approved
N. Ten State Standards

1.3 RELATED SECTIONS

A. Related sections in this specification include but may not be limited to the following.

1. Section 01 11 00 – Summary of Work
2. Section 01 33 23 – Shop Drawings, Product Data and Samples
3. Section 09 96 56 – Steel Tank Painting
4. Section 40 23 19 – Process Piping and Accessories
5. Section 40 92 13 – Process Valves and Accessories

1.4 SUBMITTALS

A. Equipment shop drawings shall be approved prior to fabrications.

B. Provide certification by a Professional Engineer and Structural Engineer licensed in Illinois that equipment design meets applicable codes.

C. Operation and Maintenance Manuals: Complete with manufacturer's instructions for equipment installation, equipment function, start-up procedures, operation, preventative maintenance, servicing and troubleshooting. Submittals shall be in accordance with Section 01 32 16.

1.5 SUPPLIER PRE-QUALIFICATION

A. To ensure proper design, satisfactory performance, quality fabrication and construction, the Filter Supplier shall satisfy the following standards and experience requirements as evidenced by submittal to the Engineer prior to submitting bids for this Section:

1. The Filters shall be designed, furnished and erected by a single Filter Supplier without subcontracting any portion of the work to outside parties.

2. The Filter Supplier shall have designed, fabricated and constructed at least ten (10) similar filters with the techniques and tolerances found in Section 3.4 with its own employees (not subcontractors with supervision).

3. Filter Supplier erection personnel shall have significant prior experience in the Boiler Maker Trade.

4. Filter Supplier field supervision shall have at least fifteen (15) years of experience in the fabrication and erection of welded conical, rectangular, or double-curvature steel plate structures.

5. All Filter Supplier shop and field welders shall be certified to ASME Section IX or AWS Section D1.1 requirements.

6. With regards to the erection crew, evidence of experience to safely erect the work must be demonstrated by a Filter Supplier's Experience Modification Rate (EMR) of less than 0.5.

7. The Filter Supplier shall submit a list of at least ten (10) Filters that have been operated continuously in a satisfactory manner for at least two (2) years on waters with similar characteristics and treatment chemistry to this treatment application.

8. The Filter Supplier shall certify by written submittal that it will bid the work inclusive of any patent licensing costs and in complete accordance with this Specification Section. If any exceptions or clarifications are taken, they shall be described in detail in the pre-qualification submittal with reference to the appropriate Specification part.

1.6 WARRANTY REQUIREMENTS

A. All equipment, unless otherwise stated, shall be warranted by the manufacturer for 12 months from date of start-up not to exceed 18 months from date of shipment.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Straight-Sided Rectangular Granulated Activated Carbon Media - Gravity Filters as manufactured by CBI, C/O. Aquaflo Technologies, Inc. (618) 664-4469, or equal.

2.2 GENERAL

A. Furnish and erect **Four (4)** Filters as shown on the Plans and as specified herein. Each Filter shall be subdivided into **Two (2)** cells with partitions.

B. The Filters shall be designed to operate on the constant rate-variable head principle wherein loss of head shall be determined by observation of the water level above the static media elevation.

2.3 DESIGN CRITERIA

A. Each filter shall be designed for the following operating conditions:

Minimum Flow (gpm)	300
Average Design Flow (gpm)	450
Maximum Flow (gpm)	600
Filtration Rate – At Underdrain (gpm/ft^2) all filter cells in service	1.4
Filtration Rate – At Underdrain (gpm/ft^2) one filter cell out of service	1.6

B. Each Filter shall be constructed to the following major dimensions:

Bottom Width - Inside (feet)	11’-0”
Underdrain Plate Width - Inside (feet)	11’-0”
Top Width – Inside (feet)	11’-0”
Total Length – Inside (feet)	30’-0’
Cell Length – Inside (feet)	15’-0”
Total Underdrain Area (ft^2)	330
Cell Underdrain Area (ft^2)	165
Underdrain Chamber Height (feet)	2’-0”
Overall Height (feet)	12’-0”

C. The shell shall be designed using the allowable stresses specified in accordance with the latest edition of AWWA D100. All other structural components shall be designed in accordance with the latest edition of AISC.

D. All external piping must be supported independently of the vessel to prevent the transfer of piping dead and live loads to the vessel shell or nozzles.

E. Unless otherwise specified, the Filter shall be fabricated from ASTM A36 steel plate and A36 structural steel. Certain miscellaneous components shall be furnished in other materials as specified herein.

F. No corrosion allowance is required.

G. The minimum thickness of the shell pressure boundary shall be 1/4” except for the underdrain and bottom plates, which shall be 3/8”.

H. The minimum thickness of all internals, weir troughs, bridge structural and other components shall be 3/16”.

2.4 COMPONENTS

2.4.1 SHELL

A. The Filter shall be rectangular in plan, constructed with straight longitudinal walls to permit greater utilization of the media depth.

B. The Filter shall be open top and shall be of all-welded construction. An underdrain plate shall be positioned near the bottom of the walls for collection of filtered water or distribution of backwash water.

2.4.2 PARTITIONS

A. Each Filter vessel shall be subdivided into multiple filtration cells by the use of internal, vertical partition plate(s).

2.4.3 BOTTOM PLATE

A. The Filter bottom shall consist of a continuous, flat plate with anchor chairs. The Filter bottom shall be designed for installation over a flat concrete foundation constructed without sumps, flumes or other non-uniform profiles.

B. The general contractor shall be responsible for the construction of the foundation.

2.4.4 UNDERDRAIN SYSTEM

A. The underdrain shall consist of a steel filter plate fitted with filter distribution nozzles and a filtered water collection or underdrain chamber that is 2’-0” in height. The underdrain shall be designed to uniformly collect water during the filtration mode, to retain the filter media and to uniformly distribute water or an air/water mixture, during the backwash mode.

B. The filter plate shall be fabricated from a minimum of 3/8" thick steel plate, reinforced to withstand a maximum differential pressure, across the filter plate during backwash, of 20 feet of water column. The filter plate shall be drilled to receive filter distribution nozzles.

C. Pipe manifold and lateral underdrain systems will not be allowed.

2.4.5 UNDERDRAIN VENT

A. The closed underdrain or collection chamber shall be vented with an external pipe with its discharge directed back towards the open, top surface of the Filter.

B. Vent nozzle, pipe and supports shall be supplied by the Filter Supplier. The vent pipe shall be fabricated of either ¼" wall carbon steel pipe or Schedule 80 PVC and also provided with a stainless-steel screen over the end of the pipe.

2.4.6 UNDERDRAIN DISTRIBUTION NOZZLES

A. The filter nozzles shall be designed for combination filtered water collection and backwash water only distribution.

B. The filter underdrain nozzles shall be orthos Liquid Systems Model D-36x0.3-M24-45-80-ø16-4xø4.5-PP. Each nozzle shall be installed into the underdrain plate floor into 1-1/8" diameter holes, including paint thickness, using an Orthos Liquid Systems Model type DB50.28.PP expanding ring. A gasket made of NSF-61 certified Santoprene material shall also be utilized per nozzle. Each filter underdrain nozzle and expanding ring shall be molded of NSF-certified polypropylene. The nozzle screen shall be supported by a minimum of one reinforcing rib perpendicular to slot length to minimize deflection in either flow direction. Nozzle slots shall be vertical and suitably sized for compatibility with the filter media and designed to prevent clogging from small particles. Nozzles shall have an 80mm stem to ensure effective pressure drop through the nozzle without relying solely on its screen. Nozzles shall be easily installed (screwed into) and removed from the top side of the underdrain and shall not require epoxy or metal fasteners for installation.

C. The nozzles shall be located on 6" centers and shall have multiple vertical tapered apertures sized to effectively retain the filter media during the filtering and backwash process, without the use of support gravel.

D. The nozzle area shall be approximately 0.003 the filter area to accurately and equally distribute backwash water. Each nozzle shall be easily removed (by unscrewing) from the top side of the filter plate, back-up nuts, couplings and filter plate threading methods are not acceptable.

E. The filter nozzles shall be fabricated of virgin polypropylene and NSF 61 approved. Evidence of NSF certification must be furnished.

F. The filter nozzle shall consist of a vertically slotted nozzle cap, threaded body, expanding ring and gasket. The nozzle component assembly shall not require gluing, heat welding or metal screws for assembly but shall consist of a mechanically locked assembly.

G. The slotted nozzle cap shall have V shaped slots for self-cleaning. The slots shall extend to the underdrain plate gasket to ensure drain down. The slots shall be supported by external rings spaced at a maximum of ½" to provide internal strength during backwash.

H. The nozzle body shall be threaded for assembly to the threaded expanding retainer ring. The nozzle shall be designed for the following conditions:

Filtration:	0.60 gpm/nozzle
Water Backwash:	5 gpm/nozzle

I. The distribution nozzles shall be assembled to the steel underdrain plate by expanding retainer rings that can be tapped through the un-threaded underdrain plate. Threading the nozzle body through the retainer ring shall expand the ring below the underdrain plate to retain the nozzle assembly in place.

J. The General Contractor shall install the filter distribution nozzles in accordance with the Filter Suppliers' instructions after performing underdrain flushing and cleaning. The General Contractor shall test the underdrain system, in the filtration mode and in the backwash mode, to verify proper nozzle installation prior to installing the media.

2.4.7 ROTARY WASHERS

A. The Filter Supplier shall furnish rotary surface washers to scour the media surface during media backwash operations. The rotary surface washers shall operate during the backwash cycle to scour the filter media and remove particles adhering to the media.

B. The rotary surface washer shall consist of a bronze or delrin rotary joint, a bronze or delrin tee, two red brass pipe laterals with nozzles and rotation indicator with watertight fitting. The nozzles shall be spaced on the laterals so as to effectively cover the surface of the bed. The rotation indicator shall be rigidly connected to the tee below the rotary joint, shall have a vertical shaft extending through a threaded coupling provided by the Filter Supplier in the inlet-backwash distribution through and shall exit the piping through a watertight fitting provided by the surface washer manufacturer.

C. The General Contractor shall install the rotary surface washer and all connecting piping, valves and controls.

2.4.8 DISTRIBUTION TROUGH

A. The inlet water shall be distributed over the media surface using a partially cut inlet pipe, running across the length of the filter. The backwash water will be collected by a fabricated washwater collection trough that is welded on the centerline of each cells' longitudinal axis. The bottom of the trough shall be V-shaped.

B. The trough shall be supported by hangers extending to a support member located at the top of the Filter. The trough shall be positioned to provide sufficient backwash freeboard.

C. An adjustable sharp edged weir plate shall be mounted directly to the upper portion of the trough. The washwater outlet nozzle shall be connected to the trough by internal piping.

D. The General Contractor shall install and level the adjustable weir plates, so they are level from Filter to Filter to ensure uniform inlet flow splitting.

2.4.9 FILTER MEDIA

The Filter Supplier shall furnish filter media in accordance with the provisions of AWWA Specification B100 and as specified herein. Filter media shall consist of One (1) – single, homogeneous layer of Granulated Activated Carbon (GAC). Clean the filter tanks before any media is placed and keep them clean throughout the placing operation.

Granulated Activated Carbon (GAC)

The media layer of each filter media shall consist of 51-inches (4.25 feet) of Granulated Activated Carbon as manufactured by Calgon Carbon of Pittsburgh, Pennsylvania. The highly porous carbon media shall be capable of physical entrapment (adsorption) of the Per and Polyfluoroalkyl substance present in the water.

The Granular Activated Carbon media shall have the following physical characteristics and design parameters:

Physical Form	Pulverized blend of high-quality bituminous coals
Apparent Density (Tamped)	0.54 grams per cubic centimeter (540 kg/m^3)
Iodine Number, mg/g	1000 (min.)
Moisture by Weight	2% (max)
Effective Size	0.55 – 0.75 mm
Uniformity Coefficient	1.9 (max)
Abrasion Number	75 (min)
Screen Size by Weight, US Sieve Series	
On 12 mesh	5% (max)
Through 40 mesh	4% (max)

The Activated Carbon Media shall be made from select grades of bituminous coal through a process known as reagglomeration to produce a high activity, durable, granular product, capable of withstanding the abrasion associated with repeated backwashing, hydraulic transport, and reactivation for reuse.

Filter Media Installation

1. The filter media shall be installed and skimmed by the General Contractor in accordance with the Filter Supplier's instructions.
2. Filter media shall be installed only after the filter distribution nozzles have been tested with flow. Filter media may be installed with water in Filters to facilitate spreading of the media.
3. Extreme care shall be exercised in the placement of all filter media to avoid damage to the filter distribution nozzles or displacement of previously placed media. When placing, classifying and skimming the media, walking directly on the media support surface, nozzles or media will not be permitted. To perform these functions, the General Contractor shall provide and place a working platform in the Filter. The platform shall be arranged to prevent crushing of the media support surface, nozzles and media.

2.4.10 NOZZLES

The Filter Supplier shall furnish the following nozzles for each cell in the filter with flanged nozzles extending 12 inches beyond the shell or plate surface. Flanges for nozzles that will be connected to external piping shall be left loose for final alignment and welding in place by the General Contractor.

Description	Number	Dia. (inches)	Type
Inlet/Backwash Outlet	1		Flanged
Outlet/Backwash Supply	1		Flanged
Underdrain Vent	1	2	Flanged
Drain	1	3	Flanged
Sluicing	1	2	Screwed
Manway	1	20	Flanged
Overflow	1		Flanged

2.4.11 ANCHORAGE

A. Anchor chairs shall be positioned around the Filter bottom and welded into the vertical side wall stiffening.

B. The Filter Supplier shall furnish, 316 stainless steel anchor bolts, nuts and washers.

C. The General Contractor shall install the anchor bolts in the concrete foundation in accordance with the Filter Suppliers' instructions.

2.4.12 FASTENERS

A. The Filter Supplier shall furnish all permanent fasteners of 304 stainless steel.

2.4.13 LEVEL CONTROL LOOP

A. The General Contractor shall furnish and install level control loops in the filtered water piping as shown on the Plans or as instructed by the Filter Supplier to maintain a minimum water level above the filter media.

2.4.14 STAFF GAUGE

A. Provide a carbon steel staff gauge inside the media filters for liquid level measurement. The depths on the staff gauge shall be engraved.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install according to Manufacturer's instructions and Plan drawings.

B. Only for larger vessels that require field welding, field inspection of butt welds shall be performed by the Filter Supplier by spot radiography in accordance with the latest edition

of AWWA D100. All radiographs shall become the property of the Owner. Inspection of shell butt welds, by sectioning (cutting plugs), oil testing or vacuum testing, will not be permitted.

3.2 FABRICATION AND ERECTION

A. Equipment supplier shall fabricate and erect equipment with its own forces. Field erection crews shall have demonstrable experience erecting the equipment to be provided. Erection by subcontractors having no previous experience erecting the equipment shall not be allowed. Welding procedures and welders certified per applicable standards this specification.

B. For field erection, welding inspection of butt welds shall be required per AWWA D-100 by spot radiography at Contractor's expense with radiographs submitted to the Engineer. Radiographic inspection shall not be required for shop fabrication.

C. Misalignment of butt joints shall not exceed 1/16 inch. Back-up bars are not permitted in butt joints.

D. Fabrication and field banding and peaking shall not exceed 1/2 inch in any 36-inch long arc when measured with a 36-inch-long sweep boards.

E. All weld spatter, burrs and slag shall be removed by chipping, grinding or brushing.

F. All external piping must be supported independently of the vessel to prevent the transfer of piping dead and live loads to the vessel nozzles or shell. All external piping, valves, and supports beyond the first vessel flange are by the general contractor.

3.3 SAND CUSHION

A. A sand cushion shall be furnished and installed under the Filter lower cylinder to provide for uniformity of bearing between the plate bottom and the foundation and as an insulator against galvanic corrosion. Cushion thickness shall be a minimum of 1 inch over flat concrete slabs. The outer circumference of the bottom plate shall be grouted full with either a non-shrink grout or a 1:1.5 cement-sand grout to contain the sand. See AWWA D100, Section 12.6, notes 1, 2 and 3.

B. Alternatively, the bottom plate may be fully grouted under its entire surface with a non-shrink grout, a pumpable grout or a 1:1.5 cement-sand grout.

C. The General Contractor shall furnish and install the sand cushion in compliance with this Specification and with the Plans which may specify sand and grout thicknesses in excess of the minimum

3.4 FOUNDATION

A. Construct according to the plan drawings and the specifications. Supplier shall furnish anchor bolts, nuts and washers.

B. The poured concrete foundation shall be level to within □1/4 inch within the total circumference of the foundation.

3.5 PAINTING

A. Factory painted interior and exterior per Specification Section 09 96 56

3.6 DISINFECTION

A. Contractor shall satisfactorily disinfect the filtration units prior to start-up complying with 35 ILL. Adm. Code 652.203.

3.7 STARTUP SERVICE/CERTIFICATION

A. Check out by manufacturer upon completion.

B. Manufacturer shall certify to the Engineer that the units have been fabricated and installed in accordance with instructions/requirements.

C. After certification and acceptance by OWNER, Manufacturer shall provide process engineer for up to four (4) days in two (2) site visits for startup and training OWNER's operators.

END OF SECTION 46 61 01